DOCUMENT RESUME

ED 191 238 EC 124 600

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TITLE Prediction of Academic Performance and Student Classification Using Five Cognitive Skills Measures. Draft.
PUB DATE Apr 80
NOTE 86p.; Paper presented at the Annual Meeting of the American Educational Research Association (Boston, MA, April, 1980). Some charts are small and may not reproduce well.

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS *Academic Achievement; Career Education; *Cognitive Tests; *Deafness; Grade Point Average; Higher Education; Prediction; *Student Characteristics
IDENTIFIERS *National Technical Institute for the Deaf

ABSTRACT

The draft report describes a study to identify the cognitive skills related to academic performance in five career areas and 19 academic majors at the National Technical Institute for the Deaf and to compare skill profile differences among groups of students (N=1,047) in the various career areas and academic majors. Results of a battery of tests were compared to the later grade point averages of the students. The five tests most predictive of academic success in general were then compared to career area and academic program levels and were found to account for a significant proportion of the grade point average variances at both the career area and academic program levels. Comparison of the groups found three significant discriminant functions. Among findings were that social work students differed from other students in that they exhibited higher reading and writing scores and somewhat lower spatial relations scores, and engineering students exhibited higher spatial relations scores than did other students. Extensive statistical data are provided for each career area and academic program level. (DB)

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Prediction of Academic Performance and Student Classification Using Five Cognitive Skill Measures

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The present study was conducted to identify the cognitive skills related to academic performance in five career areas and nineteen academic majors at the National Technical Institute for the Deaf (NTID). A secondary goal was to examine cognitive skill profile differences for groups of students in the various career areas and academic majors. The results of this study should provide valuable information for administrators examining the NTID testing program, and for academic department heads and career counselors regarding the cognitive skill measures to be used in the career counseling process.

From 1973 to 1978, NTID administered a large battery of tests to all incoming students during the summer preceding their freshman year. This battery consisted of approximately 23 measures of cognitive skill, communication skill and personal information such as age of onset of deafness. After this information was collected, it was shared with counselors and academic department chairpeople who determined how the information would be used in each department. A recent report, by the Task Force on Testing (1980), describes the use of various tests by the academic departments at NTID. No uniform statistically supported policy exists which aids decision makers in selecting measures pertinent to the cognitive skills needed for academic achievement in a given area. Therefore, departments vary in their use of test information from not using any measures, to setting cut-off scores for entry into an academic area or placement into introductory and advanced classes.

One of the purposes of this study was to determine which subset of measures of cognitive skill from the entire battery were most related

to academic performance in various NTID departments. Although three types of measures have been included in this paper, cognitive skills, communication skills and academic performance, the primary focus of this paper is the relationship between cognitive skills and academic performance. Supplementary information about the communication skill: academic performance relationship and the communication skill: cognitive skill relationship has been included in Appendix I of this paper for those interested in pursuing research of these relationships.

Four sets of factors which influence career decision making have been derived by Mitchell, et al. (1974). They are: 1) innate, genetically determined characteristics of the person; 2) environmental conditions and events; 3) learning experiences and; 4) an individual's task approach skills, i.e. habits, values and abilities. The third and fourth sets of factors have been termed "self" factors (Munson and Berman, 1978) and include cognitive skills such as reading, writing and abstract reasoning. The ability to examine and understand one's own cognitive skills in relation to a specific career area has been identified as an important component of the career decision making process (Knifelkamp and Slipitza, 1976). More specifically, the problem facing counselors, educators, and parents is; how can we help students to examine their abilities and skills, and to relate these skills to those needed for success in a particular area.

Although test performance is just one part of the information needed for career decision making, the present study identifies cognitive skill tests that are related to performance in the career programs.

This information will be used by the NTID Task Force on Test Interpretation to develop materials that easily convey test results to career counselors and students.

White (1979) began an evaluation of the testing program at NTID in 1978. He collected scores for several groups of students on measures of cognitive skill, communication skill and academic achievement. These measures are described in detail later in this paper. The groups of students White selected for study were: 1) 100 randomly selected students from Summer Vestibule Program (SVP) 1976, 2) 100 randomly selected students from SVP 1977, and 3) all of the students from 1973 to Fall of 1977 who had declared one of the following programs at NTID: Accounting (n=130), Civil Technology (n=51), Drafting (n=14), and Architecture (n=76).

One of the purposes of White's (1979) study was to determine which subset of measures when combined could best predict success at NTID. His goal was to decrease the number of tests given to incoming students from 21 to a smaller subset consisting of the best predictors. White (1979), computed a series of multiple regression analyses using cumulative Grade Point Average (GPA) as the criterion and the various cognitive and communication measures as predictors . White found that with his three samples, five tests accounted for 26% to 32.5% of the variance in GPA and could reliably predict GPA for each of his samples. The five tests which White (1979) recommended for continued use at NTID were: 1) CAT reading comprehension, 2) the Math Test developed by the NTID Math Learning Center, 3) NTID test of Written Language,

4) Spatial Relations and 5) Abstract Reasoning. The latter two tests are subsets of the Differential Aptitude Test (DAT).

In a similar vein to White (1979), one of the purposes of the present study was to identify a subset of cognitive measures from the battery of tests administered by NTID, that would provide the most non-redundant information about academic performance. However, an hypothesis guiding the present study was not evident in White's (1979) study. We hypothesized that the skills necessary for success at NTID may vary depending on the career area chosen by the student. The skills might also vary depending on the specific academic program chosen within a career area. Consequently, our approach to sampling differed from White's (1979) study. White's samples mixed together students from different career areas and academic programs. Our study engaged a larger number of students and grouped students according to career area and academic program (major).

From a total of 1406 hearing-impaired students attending NTID during the years 1973 to 1978, 1047 students had completed thirty or more credit hours at NTID by the time this study was initiated (summer, 1979). All of the 1047 students were included in this study.

Testing at NTID

All incoming students at NTID attend the Summer Vestibule Program (SVP) held each summer prior to the student's first quarter at NTID. During the first two weeks of each SVP approximately 25-30 hours of tests were administered to students. From SPV 1973 to SVP 1978, the

same battery of tests (with small yearly variation) was given at NTID. The following is a description of these tests and the academic achievement measures used in this study:

Cognitive Measures

Comparative Guidance and Placement Program (1971):

Reading consists of brief passages which are followed by items that measure a student's comprehension of the ideas and specific details in the passage.

Sentences measures a student's mastery of the rules and constraints of standard written English. It requires recognition of errors in grammar, usage, choice of words, idiom, capitalization and punctuation.

The Mathematics subtest (form c) is comprised of computation and applied arithmetic that is designed for students who have studied no algebra or have had less than one year of it.

The Year 2000 test requires the students to follow increasingly complex directions for selecting certain dates from a calendar for the year 2000. The manual indicates this test is useful in assessing students' abilities to read and understand simple directions in a written context.

Mosaic Comparisons subtest is designed to measure perceptual speed and accuracy. It consists of three separately timed parts, each of which is allotted three minutes. For each item, the subject is required to inspect two generally similar patterns resembling floor tiles and to identify the components of the two patterns that are different. The patterns represented by the three parts of the tests are of increasing complexity.

Letter Groups subtest measures inductive reasoning ability in a non-verbal context. Subjects are asked to determine the rule in a pattern governing the placement of alphabetic characters and to recognize the letter group that differs from the pattern.

Differential Aptitude Test (Bennet, Seashore and Wesman, 1966):

Verbal Reasoning subtest is used as a measure of ability to understand concepts framed in words. Using words, it evaluates a student's ability to abstract or generalize and to think constructively, rather than simple fluency or vocabulary recognition.

Abstract Reasoning is intended as a non-verbal measure of a student's reasoning ability. The test requires perception of an operating principle in a series of changing diagrams.

The subject must discover the principle or principles governing the change of figures and give evidence of his understanding by designating a diagram which would logically follow.

Clerical Speed and Accuracy is intended to measure speed of response in a simple perceptual task. It is designed to measure the student's speed and accuracy with simple number and letter combinations: it places heavy emphasis on speed. It is of relatively little importance for most educational purposes, although a person who scores very low may find it difficult to meet classical standards of neatness, speed and precision.

Mechanical Reasoning consists of a pictorially presented mechanical situation together with a simply-worded question, and is designed to assess the ability of a person to learn the principles of operation and repair of complex devices.

Space Relations represents a combination of the ability to visualize an object from a picture and then to imagine how the object would appear if rotated in various ways. The manual suggests it is a measure of ability to deal with concrete materials through visualization.

Mathematics Diagnostic Test System:

The total score for this test is the sum of scores of four subtests-fractions, decimals, percentages and algebra. The tests were developed at NTID in the Math Learning Center.

California Achievement Test (CAT):

Reading Comprehension consists of items related to following directions, reference skills and interpretation of materials.

Vocabulary consists of 60 items which assess the student's knowledge of vocabulary in mathematics, science, social science and "general".

NTID Test of Written Language:

Developed at NTID by the English Department. The content for this test is obtained by asking students to write a story based on their viewing of a two minute non-verbal cartoon movie. The content is then judged according to guidelines described by Crandall (1976) for correctness of grammar and punctuation.

Stanford Achievement Test (SAT) Advanced Battery (Form X):

Applying NTID students are encouraged to submit achievement test scores. The SAT yields scores for Reading Comprehension, Language, Math Comprehension, Math Concepts, Math Applications, and Battery Total.

Communication Measures

Pure Tone Average testing is performed for each student entering NTID. Pure tone averages used are calculated from the dB average for the three frequencies: 500, 1000, 2000 Hz, and selecting the lowest average representing the better ear. One hundred and twenty was substituted when no response was elicited at the limits of the audiometer according to the system for obtaining pure tone averages developed by the Office of Demographic Studies (1973).

Speechreading with Sound and Speechreading Without Sound

Two separate scores, are derived from results of these tests developed at NTID (Johnson, 1976). For each test, the student is presented a form of the CID Everyday Sentences list (Davis and Silverman, 1964) in a color film format. The sentences are spoken without sound for speechreading without sound and with sound for speechreading with sound. The student's task is to reproduce each of ten sentences in writing. Scores are assigned based on the percentage of 50 key words a student correctly identifies in ten sentences.

Manual and Simultaneous Reception:

To obtain the two scores for these tests, the student is also presented a form of the CID Everyday Sentences list. The response procedure is similar to that for the speechreading

tests except for the Manual test the protagonist on the film is signing and fingerspelling. There is no speech or lip movement on this test. For the Simultaneous test the requirements are the same except speech is provided to enable the student to use sign, speech and speechreading in receiving the message. As with the speechreading tests, the scores on these tests represent the number of key words correctly identified out of a total of 50.

Speech Intelligibility is conducted by five specially trained speech pathologists who listen to and independently score tape recordings of each student reading the "Rainbow Passage" (Fairbanks, 1966). A rounded average is then assigned to derive a score for intelligibility ranging from "Listener understands complete message" to "Listener cannot understand the message."

Hearing Discrimination scores are derived using a technique described by Johnson (1976). Students are categorized on 5 different levels according to the number of key words they are able to identify in two different tasks. CID Everyday Sentence list (Davis and Silverman, 1964) and a same-difference task.

Academic Performance Measure

Cumulative Grade Point Average (GPA) is the mean grade for all courses completed by each student at NTID during the time period between the student's first quarter and the end of the spring quarter 1979.

Description of Career Areas, Academic and Degree Programs

NTID was established by an Act of Congress in 1968, and became a federally funded school for the hearing impaired at the Rochester Institute of Technology (RIT). Students enrolled at NTID could take advantage of all the opportunities provided to hearing students in other RIT colleges, both socially and academically. Hearing impaired students could either major in academic programs offered by NTID or cross register and major in academic programs offered in various other colleges of RIT. NTID programs offer the student a certificate, diploma or AAS degree. A student could cross-register in other RIT technical and professional education programs and obtain an associate, bachelor's or master's degree.

The academic programs available to students have been grouped into five career areas according to the NTID catalogue for 1978-79. The career areas and included academic programs have been listed below. The academic programs which were included in this study were those in which NTID students were enrolled between 1973 and 1978. Therefore, not all programs which have been listed below, were included in this study. A complete list has been included here for information and referential purposes.

(INSERT TABLE 1 HERE)

Table 1

Career Areas and Programs

at NTID and RIT.

Five NTID/RIT Career Areas	NTID Technical Education Programs	Other RIT Technical and Professional Education Programs
Business	- Accounting - Office Practice & Procedures - Business Data Processing	- Accounting - Business Administration - Food Service Administration - Hotel & Tourist Industries Management - Dietetics & Nutritional Care - Retailing - Photographic Marketing - Packaging Science - Applied Software Science - Computer Science - Computer Systems - Systems Software Science - Computer Engineering
Engineering	- Architectural Technology - Civil Technology - Industrial Drafting - Industrial Drafting Technology - Electromechanical Technology - Manufacturing Processes - Numerical Control	- Electrical Engineering - Computer Engineering - Industrial Engineering - Mechanical Engineering - Civil Engineering Technology - Electrical Engineering Technology - Mechanical Engineering Technology - Packaging Science

Science	- Medical Laboratory - Medical Record Technology - Optical Finishing Technology	- Biology - Chemistry - Clinical Chemistry - Chemical Technology - Mathematics - Computational Mathematics - Medical Technology - Nuclear Medicine - Respiratory Therapy - Physics - Biomedical Photography
Visual Communications	- Printing Production Technology - Applied Art	- Audiovisual Communications - Photographic Processing and Finishing Management - Printing - Professional Photography - Biomedical Photo Communications - Photo Science and Instrumentation - Communication Design - Environmental Design - Fine Arts - Ceramics/Ceramic Sculpture - Glass - Metalcrafts
Social Services		- Social Work

Method

The present study was divided into three phases of analysis, each with separate goals. Phase I was essentially an extension of White's (1979) study. Its purpose was to identify a subset of the 21 cognitive skill measures administered at NTID that was related to academic success and gave non-redundant information. Phase II was an indepth examination of the predictability of success (GPA) at both the career area level and the academic program level. Its purposes were; 1) to determine the amount of GPA variance accounted for by the subset of cognitive skill measures identified in Phase I; and 2) to determine if a clearer picture of the cognitive skill academic performance relationship can be obtained when the relationship is examined at the academic program level rather than within a general career area. Phase III was an examination of the cognitive skill measures' ability to distinguish between various groups of students. Its purposes were to determine if students in the five RIT/NTID career areas differed in their cognitive skills and to determine if students in various academic programs within a career area differed in their cognitive skills.

Phase I - Intercorrelations

Phase I examined the intercorrelations and predicative capability of the total set of cognitive and communication variables available on our sample of 1047 students. The focus of this phase was on answering the question: "Which few tests should be administered to or required of all incoming students?" These tests need to provide the most non-redundant

information about success at NTID. Therefore, for each of the five career areas of NTID, Pearson correlations of all measures of communication skills, cognitive skills and performance were computed. The results of these analyses appear in Appendix A on page 48. Only students who had 30 or more credit hours at NTID were included (N=1047).

The correlations of most interest were those between the cognitive skill variables and GPA. Each of these correlations indicates how much variance a particular test and GPA have in common. Therefore, the higher the correlation between GPA and a test variable, the more the test variable "explains" GPA, or success at NTID. Ideally, we would like several tests to have high correlations with GPA and low or zero order correlations with each other. Low correlations between tests would indicate that the tests do not explain redundant information. Table 2 presents the cognitive skill measures which have significant correlations with GPA and their intercorrelations with the five predictors proposed by White (1979). Four to six cognitive skill measures other than those proposed in the White (1979) study were found to have significant correlations with GPA for each of the career areas. However, correlations of these measures with the five selected by White (CAT Reading Comprehension, Math, Writing, Abstract Reasoning and Spatial Relations) were also significant and comparatively quite large. For example, in the Visual Communications career area, four measures in addition to the proposed five correlated significantly with GPA: Verbal Reasoning, Numerical Ability, Mosaic Comparisons and Letter Groups. However, 4 out of 5 measures proposed by White (1979) had significant

Table 2

Cognitive Skill Measures Having Significant Correlations with G.P.A.

and their Intercorrelations with the Five Proposed Predictors.

Career Area		Correlations of Cognitive Skill Measures and G.P.A.[a]		Intercorrelations with Proposed Predictors[b]				
				CAT	MAT	ABT	SRE	WRI
Business	D	Verbal Reasoning	= .25	.66	.45	.34	.31	.39
	C	Reading Comp.	= .16	.54	.34	.23	.16	.34
	C	Sentences	= .18	.61	.34	.28	.12[c]	.52
	C	Year 2000	= .16	.63	.39	.34	.13	.48
	C	Letter Groups	= .17	.38	.49	.46	.43	.13
		Reading Comp.	= .28					
	C	Math	= .28					
		NTID Writing	= .22[c]					
	D	Abstract Reasoning	= .16					
	D	Spatial Relations	= .20					
Engineering	D	Clerical Speed	= .20	.05[c]	.22	.22	.27	.08
	D	Numerical Ability	= .39	.43	.77	.50	.51	.33
	D	Mech. Relations	= .20	.49	.27	.36	.49	.34
	C	Year 2000	= .19	.64	.38	.30	.27	.42
	C	Mosaic Comparisons	= .17	.11	.38	.29	.42	.09
	C	Letter Groups	= .19	.27	.51	.38	.44	.09
		Reading Comp.	= .30					
	C	Math	= .31					
		NTID Writing	= .27					
	D	Abstract Reasoning	= .20					
	D	Spatial Relations	= .25					
Visual Communications	D	Verbal Reasoning	= .17	.68	.44	.36	.29	.48
	D	Numerical Ability	= .24	.29	.70	.32	.35	.20[c]
	D	Mosiac Comparisons	= .18	.11[c]	.21	.16	.40	.06[c]
	D	Lettergroups	= .19	.38	.41	.35	.35	.21
		Reading Comp.	= .20					
	C	Math	= .24					
		NTID Writing	= .20					
	D	Abstract Reasoning	= .16					
	D	Spatial Relations	= .22					

(Continued)

Table 2—Continued

Cognitive Skill Measures Having Significant Correlations with G.P.A.

and their Intercorrelations with the Five Proposed Predictors.

Career Area		Correlations of Cognitive Skill Measures and G.P.A.[a]		Intercorrelations with Proposed Predictors[b]				
				CAT	MAT	ABT	SRE	WRI
Science		Clerical Speed	= .33	.28	.24	.30	.26	.03[c]
	C	Sentences	= .28	.67	.35	.25	.20	.51
	D	Mosiac Comparisons	= .22	.14[c]	.37	.35	.50	-.02[c]
	D	Letter Groups	= .21	.44	.44	.43	.42	.21
		Reading Comp.	= .33					
	C	Math	= .30					
		NTID Writing	= .30					
	D	Abstract Reasoning	= .22					
	D	Spatial Relations	= .18					
Social Work		Clerical Speed	= .49	-.18[c]	.19[c]	.32[c]	-.05[c]	-.38
		Reading Comp.	= .42					
	C	Math	= .28[c]					
		NTID Writing	= .08[c]					
	D	Abstract Reasoning	= .02[c]					
	D	Spatial Relations	= .02[c]					

Note. C = subtest of the Career Guidance and Placement Program
D = subtest of the Differential Aptitude Test

[a]All correlations of GPA with Abstract Reasoning, Spatial Relations, Math and NTID Writing have been listed for purposes of comparison. These correlations are not always significant. (This information was subtracted from Appendix I.)

[b]CAT = CAT reading comprehension
MAT = Math subtest of the Career Guidance and Placement Program
ABT = Abstract Reasoning subtest of the Differential Aptitude Test (DAT)
SRE = Spatial Relations subtest of the DAT
WRI = NTID test of Written Language

[c]Not significant

correlations with GPA of .20 or greater, whereas only one out of the other four measures had correlations with GPA equal to or exceeding .20. In addition, the 5 proposed measures have high intercorrelations with the 4 significant predictors, indicating that these other tests add little new information to that obtained from the five predictors.

The results are much the same for each of the career areas. In general, CAT reading comprehension, Math, Writing, Abstract Reasoning and Space Relations have correlations with GPA equal to or exceeding those of the other cognitive skill measures. The majority of the variance in the other measures can be explained by the five proposed variables. Therefore, the present study supports White's conclusion that CAT reading comprehension, Math, NTID Writing, Abstract Reasoning and Spatial Relations measures do provide the most non-redundant information about success at NTID as measured by cumulative GPA. It is important to note that White (1979) used NTID's math test as a predictor and the present study uses the math test from the CGPP. Further analyses will use the CGPP math since the NTID math test was not consistently administered to our sample, and the two math tests are highly correlated (r=.79).

Admission Testing

Approximately 75% of the students who apply to NTID submit scores on the Stanford Achievement Test: Advanced Battery (SAT). To explore the possibility of using the five subtests of the SAT (Reading Comprehension, Language, Math Comprehension, Math Concepts, Math Applications) for career counseling, the subtest and total test scores were correlated

with GPA. Appendix A presents the SAT - GPA correlations for each of the five career areas. Of the 30 SAT - GPA correlations presented in Appendix A, surprisingly none were found to be significant in any of the career areas. Although professing to measure different cognitive skills, the subtests of the SAT were significantly intercorrelated with an average range of .82 to .96 within each of the five career areas.

Since these tests did not relate to academic success at NTID, and did not measure separate cognitive skills, we have recommended that they <u>not</u> be utilized with future students. The SAT should not be used for the selection or advising of students.

Thus, the results of Phase I analyses indicate that the five cognitive skill tests proposed by White (1979), have high internal consistency, are positively related to academic achievement (GPA), within career areas, and adequately account for the other measures administered during the 1973-1978 time period.

Phase II Prediction of Academic Success

The purpose of Phase II was to provide administrators, career counselors and students with information about the relationship of performance on the five cognitive skill tests selected in Phase I, to academic performance at NTID. The cognitive skill/academic performance relationship was examined within career areas and within each academic program. It was hypothesized that the cognitive skill - academic achievement relationship would be more clearly defined within an academic program (major) than within a broad career area. The assumption that led to this hypothesis was that by specifically defining an area of study, it becomes easier to define the skills necessary for success in that area. Thus by moving from the career area to a program within a career area, we are focusing on a more homogeneous set of skills.

Stepwise multiple regression analyses were used to examine the cognitive skill - academic achievement (GPA) relationship. Three important statistics were derived from the multiple regression analyses: 1) the simple correlations (r) of the five cognitive skill measures with GPA, 2) the multiple correlation and squared multiple correlations (R^2), and 3) the Beta weights for each cognitive skill measure. The squared multiple correlation (R^2) indicates the amount of variance in GPA explained by a linear combination of the five cognitive skill measures. The multiple correlation is derived in a stepwise manner. That is, the variable that has the highest correlation with GPA enters the equation in the first step. The next variable to enter the equation

is selected by its partial correlation with GPA, after removing the variance explained by the first variable. This procedure continued until all five cognitive skill measures were included in the equation. By examination of the Beta weights, the independent contribution of each skill measure to the prediction of GPA was determined.

Regression Analysis - Career Areas

Appendix C presents the regression analysis summary tables for each career area. The most salient information from these regression analyses was abstracted in Table 3. The multiple correlation was significant for each career area. The amount of GPA variance explained by the five measures, varied from 11.6% for the Visual Communication area to 25.3% for the Social Work area. Although the actual predictive ability of the five cognitive measures is not outstanding, some interesting patterns emerge from the data. Math skills have the strongest relationship to academic achievement in the Business and Engineering career areas. Reading and Writing are also important contributions to prediction of GPA for these areas. In the Science area, Writing, Math and Reading Comprehension skills contributed in approximately equal proportions to the prediction of GPA. In the Visual Communications area, Space Relations and Writing were the cognitive skills most predictive of GPA. In the Social Work area, the best predictor was Reading Comprehension, accounting for 16% of the variance. The second best predictor was Math, accounting for an additional 3% of the variance. Thus, the actual cognitive skill measures which were most important for predicting GPA were the same for each career area with Math being

Table 3

Total Number of Students having 30 or More Hours in Each of the Five Career Areas at NTID, the Percent of Variance Accounted for by Five Tests and the Rank Order of Each Test Relative to the Other Four Tests in that Area.

Career Area	N	Multiple R	R-Square Total (%)	Test[a]				
				CAT	MAT	ABT	SRE	WRI
Business	307	.36	13.0	2(.13)	1(.20)	5(-.03)	3(.10)	4(.09)
Engineering	225	.42	17.5	4(.11)	1(.18)	5(.03)	3(.12)	2(.16)
Science	147	.39	14.9	3(.14)	2(.15)	4(.07)	5(.02)	1(.16)
Visual Communications	188	.34	11.6	4(-.06)	3(.15)	ø[b]	1(.20)	2(.19)
Social Work	43	.50	25.3	1(.42)	2(.27)	4(-.14)	5(-.13)	3(.21)

Note. CAT = CAT reading comprehension
MAT = Math subtest of the Career Guidance and Placement Program
ABT = Abstract Reasoning subtest of Differential Aptitude Test (DAT)
SRE = Spatial Relations subtest of DAT
WRI = NTID test of Written Language

[a]Numbers in parentheses are Beta weights for each test.

[b]ø indicates that variable did not enter into the equation.

the most important predictor for the Business and Engineering areas and Space Relations the most important for the Visual Communications area. Although the actual predictive power was not overwhelming, the cognitive skill academic performance relationships uncovered made intuitive sense. Prediction of academic performance was more meaningful at the academic program level.

Regression Analysis - Academic Programs

Appendix D presents the regression analysis summary tables for the 19 academic programs at NTID/RIT. The nine students in the Electronics program in the Engineering area were not included in these analyses due to the small sample size. Also, further analyses are needed to clarify the data for the Colleges of Engineering and Science. The results for these programs will not be discussed in this paper. The most salient information from this series of regression analyses was abstracted in Table 4. Examination of Table 4 indicates that there was greater predictive power within academic programs than was found in the broader career areas. In fact, 15 of the 18 within program multiple correlations were higher than the multiple correlations for the respective career area. Thus, our hypothesis regarding the clarity of the cognitive skill - academic achievement relationship at the program level was confirmed.

The test(s) with the greatest predictive power varied across the career areas and programs. In general, Math skills were highly related to academic performance in the Business and Engineering areas. Exceptions were found in that Space Relations was the best predictor for the Industrial Drafting Program (Engineering) and Reading Comprehension was the best predictor for the College of Business program.

Table 4

Total Number of Students Having 30 or More Hours in Each of the Listed NTID Academic Programs, the Percent of Variance Accounted for by Five Tests and the Rank Order of Each Test Relative to the Other Four Tests in that Program.

Career Area	Program	N	Multiple R	R-Square Total (%)	Test[a] CAT	MAT	ABT	SRE	WRI
Business									
	College of Business Majors	34	.43	18.2	1(.31)	3(.14)	2(.15)	Ø	4(-.09)
	Accounting	67	.45	20.6	3(.19)	1(.31)	4(.13)	5(.11)	2(.28)
	Data Processing	104	.47	22.4	3(.11)	1(.31)	5(-.01)	4(.11)	2(.16)
	Office Practice	83	.48	22.7	2(.23)	1(.30)	4(-.05)	3(.13)	5(-.02)
Engineering									
	College of Engineering	14	.70	48.7	4(.30)	1(-.82)	5(.03)	2(.44)	3(-.39)
	Architectural Tech	20	.87	76.5	4(.11)	3(.14)	5(-.04)	2(.17)	1(.70)
	Civil Tech	25	.57	32.0	2(.25)	1(.47)	5(.03)	3(-.16)	4(.13)
	Industrial Drafting	24	.60	35.9	3(.23)	5(.09)	2(-.24)	1(.54)	4(-.10)
	Electro-Mechanical Tech	49	.61	36.7	4(.10)	1(.38)	5(-.08)	3(.11)	2(.32)
	Manufacturing Processes	36	.30	9.1	1(.22)	3(.09)	4(-.06)	2(.12)	5(.03)
Science									
	College of Science	19	.35	12.2	5(-.05)	4(-.05)	3(-.10)	1(-.31)	2(.11)
	Optical Finishing	47	.37	13.8	2(.11)	1(.31)	3(.09)	4(.06)	5(.03)
	Medical Lab Tech	32	.61	37.3	1(.35)	4(.23)	2(-.26)	5(.19)	3(.25)
	Medical Record Tech	35	.77	58.6	2(.26)	1(.33)	3(.24)	5(.10)	4(.13)
Visual Communications									
	College of Fine and Graphic Arts	29	.51	25.6	5(-.13)	1(.38)	2(.27)	4(-.14)	3(.14)
	Applied Photography	67	.48	22.8	Ø	2(.14)	3(-.11)	1(.42)	4(.07)
	Printing	53	.41	17.0	5(-.03)	2(.23)	3(-.04)	4(.04)	1(.35)
	Applied Art	37	.46	21.1	2(-.28)	3(-.13)	1(.59)	Ø	Ø
Social Work									
	Social Work	43	.50	25.3	1(.42)	2(.27)	4(-.13)	5(-.13)	3(.21)

[a]Numbers in parentheses are Beta weights for each test.

[b]Ø indicates that variable did not enter into the equation.

CAT = CAT reading comprehension
MAT = Math subtest of the Career Guidance and Placement Program
ABT = Abstract Reasoning subtest of the Differential Aptitude Test (DAT)
SRE = Spatial Relations subtest of the DAT
WRI = NTID test of Written Language

Within the Science area, Math was the best predictor for the Optical Finishing and Medical Records programs whereas Reading Comprehension was the best predictor for the Medical Laboratory Technology program. Within the Visual Communications area, the cognitive skill most predictive of academic achievement was different for each of the four programs. It is interesting to note that the only programs in which Abstract Reasoning and Space Relations were ranked first in predictive power were art related programs. Space Relations was ranked first for the Applied Photography and Industrial Drafting area. Abstract Reasoning was ranked first only in the Applied Art program. Across the 19 programs, Abstract Reasoning was the least important predictor of GPA.

In summary, the five tests selected in Phase 1 accounted for a significant proportion of GPA variances at both the career area and academic program levels. The strongest cognitive skill - academic achievement relationships occured within academic programs. It is our intent that information in Phase II be utilized to provide information to students about which cognitive skills are related to academic performance at NTID. When a student is undecided about which career area is most appropriate for him/her, some information can be provided about which cognitive skills were related to performance in each area. When a student chooses an academic program, specific information can be provided about the student's strengths and weaknesses and chances for success.

Phase III - Discriminant Analysis and Student Classification

The purpose of the third phase of this study was to examine possible cognitive skill differences between groups of students. The groups considered, consisted of students in each of the five career areas (Business, Engineering, Science, Visual Communications and Social Work) offered at NTID. Our goal was to examine the ways that students in these career areas differ from each other. A secondary goal was to explore the cognitive skill differences of students in various programs within a career area.

Because of the multicollinearity of the variables, group differences were explored through the use of stepwise multiple discriminant analysis (MDA). The mathematical algorithm performed by the MDA procedure weights and linearly combines the "discriminating variables" so as to provide the greatest average separation among the groups. Through utilization of the MDA procedure, the investigators were able to determine whether group profiles on the cognitive skill measures were significantly different. By using the stepwise procedure, only variables contributing to group profile differences were included in the final analysis. Further, it was possible to use the resulting analysis for establishing rules for the classification of students into one of the existing groups based on the similarity of score profiles. The discriminant variables included in these analyses were the five cognitive skill measures which were found to be significantly related to academic achievement in the

previous sections of this paper. The five cognitive skill measures were Space Relations, Abstract Reasoning, Math, Reading Comprehension and Writing. These particular measures were selected in an effort to examine group differences with a set of variables deemed important for academic success.

Discriminant Analysis - Career Areas

Using scores on the five cognitive skill measures for students in each of the five career areas, three discriminant functions were found to be significant (Table 5). The equation that resulted from this analysis correctly classifies 35% of the students. That is, using scores from the five cognitive skill tests and weights derived through multiple discriminant analysis, 35% of the students were classified into their career area. Although these cognitive measures and discriminant functions are only moderately successful at differentiating among students in the different career areas, some significant and interesting findings are present in the data. Figure 1 presents a plot of the group centroids (composite means) on the first and second disciminant functions. The first discriminant function serves to separate the Social Work students from students in the other four career areas. The meaning of the first discriminant function can be understood by examining the standardized discriminant function coefficients for each variable presented in Table 5 . These coefficents can be interpreted in much the same way as Beta weights in multiple regression analysis. The relative contribution of the associated variable (cognitive skill measure) is determined by examining the absolute value of the discriminant function coefficients.

Table 5

Multiple Discriminant Analysis Results Using Students in NTID's Five CAREER Areas and Proposed Cognitive Skill Measures.

Variable	Standardized Coefficients			Step of Entry	Wilks Lambda
	Function 1	Function 2	Function 3		
CAT	-.532	-.334	-.626	1	.896*
SRE	.717	-.539	-.639	2	.793*
WRI	-.420	-.024	-.083	3	.765*
MAT	-.033	-.389	.949	4	.740*
ABT	-.087	-.037	.423	5	.736*

*$p < .001$

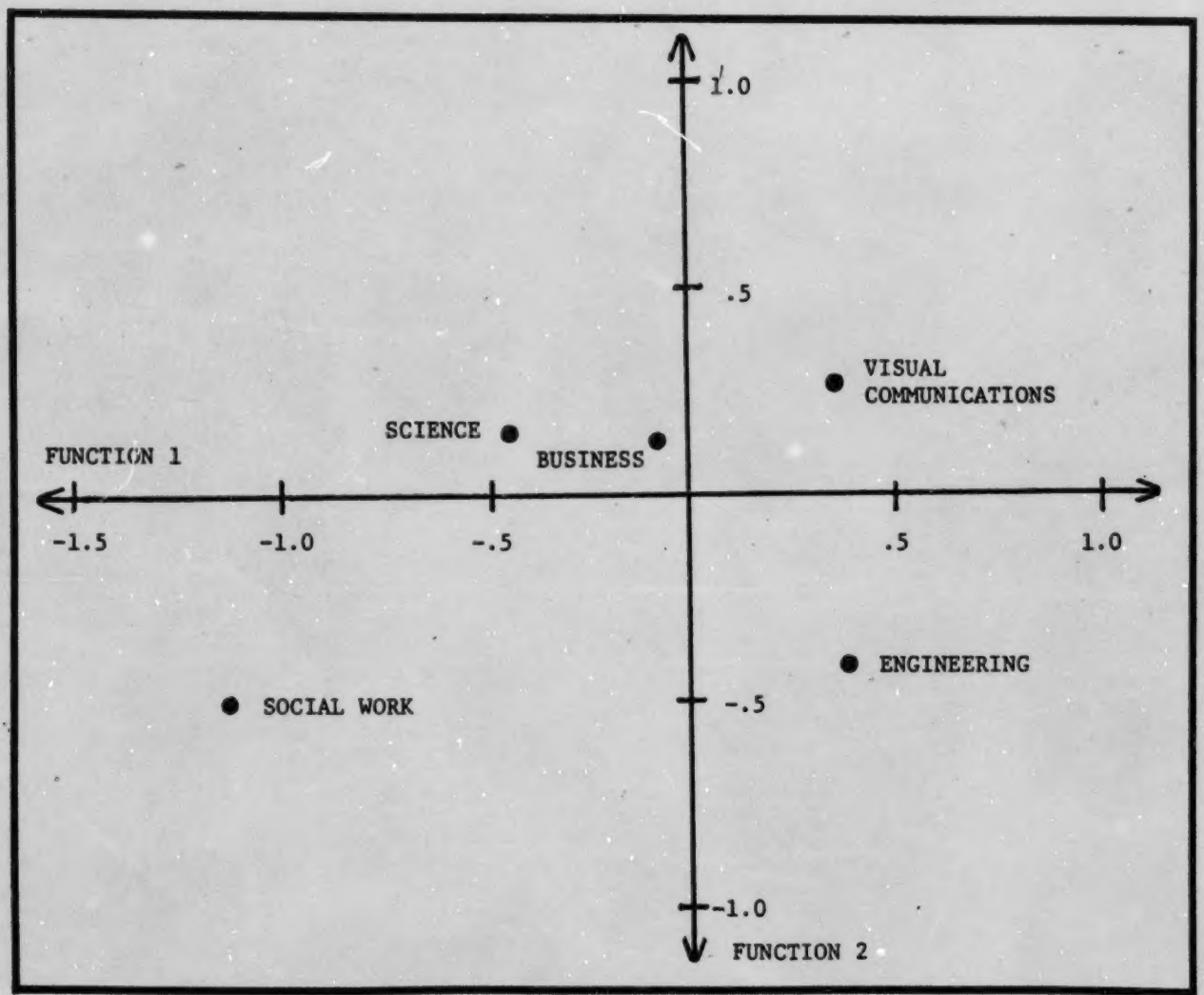

Figure 1. Centroids of the five career groups on the first and second discriminant functions.

Table 6

Classification Results for NTID Students from

Five Academic Areas Using Three Discriminant Functions.

Actual Academic Area	Number of Students	Predicted Group Membership[a]				
		Business	Engineering	Science	Visual Communications	Social Work
Business	307	65 (21.2)[b]	66 (21.5)	49 (16.0)	72 (23.5)	55 (17.9)
Engineering	225	25 (11.1)	104 (46.2)	14 (6.2)	47 (20.9)	35 (15.6)
Science	147	22 (15.0)	15 (10.2)	37 (25.2)	28 (19.0)	45 (30.6)
Visual Communications	188	25 (13.3)	34 (18.1)	22 (11.7)	79 (42.0)	28 (14.9)
Social Work	43	2 (4.7)	4 (9.3)	4 (9.3)	0 (0.0)	33 (76.7)

[a]The diagonal of this matrix presents the percent of correctly classified students for each career area. The percent of correctly grouped students for all areas = (34.95).

[b]Figures in parentheses are percentages of students classified into the different areas.

An examination of the coefficients contained in Table 5 indicated that the first discriminant function was defined by Space Relations, Reading Comprehension and Writing. The standardized coefficients and the group centroids indicate that Social Work students achieve higher Reading Comprehension (M=11.08) and Writing (M=9.42) scores than do students in the other four areas (Reading Comprehension, M=9.41, Writing, M=8.52). However, Social Work students tend to score somewhat lower on Spatial Relations (M=33.41) than do students in the other four career areas (M=35.08).

The second discriminant function was less clear than the first, and appeared to be a composite of Spatial Relations, Reading Comprehension and Math. As seen in Figure 1, the second discriminant function separated students in Engineering and Social Work programs from students in other career areas. An examination of group means on the variables contributing to this function indicated that Social Work and Engineering students tended to score somewhat higher (M=49.77) on the MAT math test than did students in the other three areas (M=46.41). The contribution of the Spatial Relations variable to the second function was primarily one of separating the Engineering students with high scores (M=41.36) from students in the other areas with considerably lower scores (M=32.93).

The third disciminant function did not add to our understanding of group differences but did provide additional accuracy for the classification of students to groups based on their score profiles. Table 6 presents the results of a classification analysis performed using weights derived from the multiple discriminant analysis and the students' raw

scores on the five cognitive skill measures. Approximately 35% of the 910 students in this analysis could be "correctly" classified into their chosen program based on these five cognitive skill measures. It was interesting to note that our ability to classify students varied with the career area. Approximately 77% of the Social Work students, 46% of the Engineering students, and 42% of the Visual Communications students were correctly classified, while only 21% of the Business students were correctly classified. This variability was determined primarily by the uniqueness of student profiles for a given career area. Thus, Social Work students were most easily classified because, in general, they exhibited high Reading Comprehension, Writing, Math and Abstract Reasoning scores when compared to students in the other areas.

In summary, a MDA was conducted and three significant discriminant functions were derived. All five cognitive skill variables entered into the composition of the functions. The analyses indicated that Social Work students differed from students in the other career areas in that they exhibited higher Reading and Writing scores and somewhat lower Spatial Relations scores. Engineering and Social Work Students had higher Math scores than did students in the other areas. Engineering students also exhibit higher Space Relations scores than did students in the career areas. A clearer understanding of the importance of these measures for each career area was derived by examining the score profiles of students <u>within</u> each of the five career areas.

Discriminant Analysis - Academic Programs

A series of discriminant analyses were conducted to examine cognitive skill differences of students in the academic programs within each career area. Since the Social Work career area had only one academic major, this area was not analyzed. Table 7 presents the classification results for the discriminant analyses conducted within each career area. The most accurate classification occurred within the Business and Science areas with 45% and 41% of the students correctly classified for each area. Two significant discriminant functions were derived for the Business and Engineering area while only one discriminant function was obtained for the Science and Visual Communications area. Other noteworthy information contained in Table 7 will be discussed as it pertains to the results of each career area.

Business Programs

In the Business Careers area, two significant discriminant functions were derived that correctly classified 45% of the students. Table 8 presents the standardized discriminant function coefficients for each variable. Abstract Reasoning was not included in the anlysis since it did not add to the discriminating power of the other variables.

The first discriminant function was composed primarily of Reading Comprehension and Math. These measures were the first two variables to enter the discriminant equation and thus were the two most important variables for examining program differences within Business. As seen in Figure 2, the first discriminant function separated students into three groups. The first group was comprised of College of Business students with high Reading Comprehension (M=10.87) and high Math (M=55.88) scores.

Table 7

Number and Percent of Correctly Classified Students in Each Academic Program Using Multiple Discriminant Analysis of Five Cognitive Skills.

Career Area and Academic Program	N	Number of Significant Functions	Number of Cognitive Skills Entering Functions	Number of Students Correctly Classified	Percent of Students Correctly Classified
Business		2	4		45[b]
College of Business	34			29	85
Accounting	67			8	12
Data Porcessing	104			36	35
Office Practices	83			58	70
Engineering[a]		2	4		35
College of Engineering	14			11	79
Architectural Tech	20			3	15
Civil Tech	25			10	40
Industrial Drafting	24			6	25
Electro-Mechanical Tech	49			8	16
Manufacturing Processes	36			21	58
Science		1	3		41
College of Science	19			15	79
Optical Finishing	47			8	17
Medical Lab Tech	32			8	25
Medical Record Tech	35			24	69
Visual Communications		1	2		38
College of Fine and Graphic Arts	29			22	76
Applied Photography	67			18	27
Printing	53			30	57
Applied Art	37			1	3

[a]Electronics students not included due to small sample size.

[b]Percent of students in a career area correctly classified.

Table 8

Multiple Discriminant Analysis Results Using Students in Four BUSINESS Programs and Proposed Cognitive Skill Measures.

Variable[a]	Standardized Coefficients		Step of Entry	Wilks Lambda
	Function 1	Function 2		
CAT	-.638	-.318	1	.741*
MAT	-.510	.939	2	.662*
SRE	.047	-.720	3	.632*
WRI	-.051	-.490	4	.610*

[a]ABT (Abstract Reasoning) did not add to the discriminating power of the other variables, consequently it was not included in the discriminant functions.

*p < .001

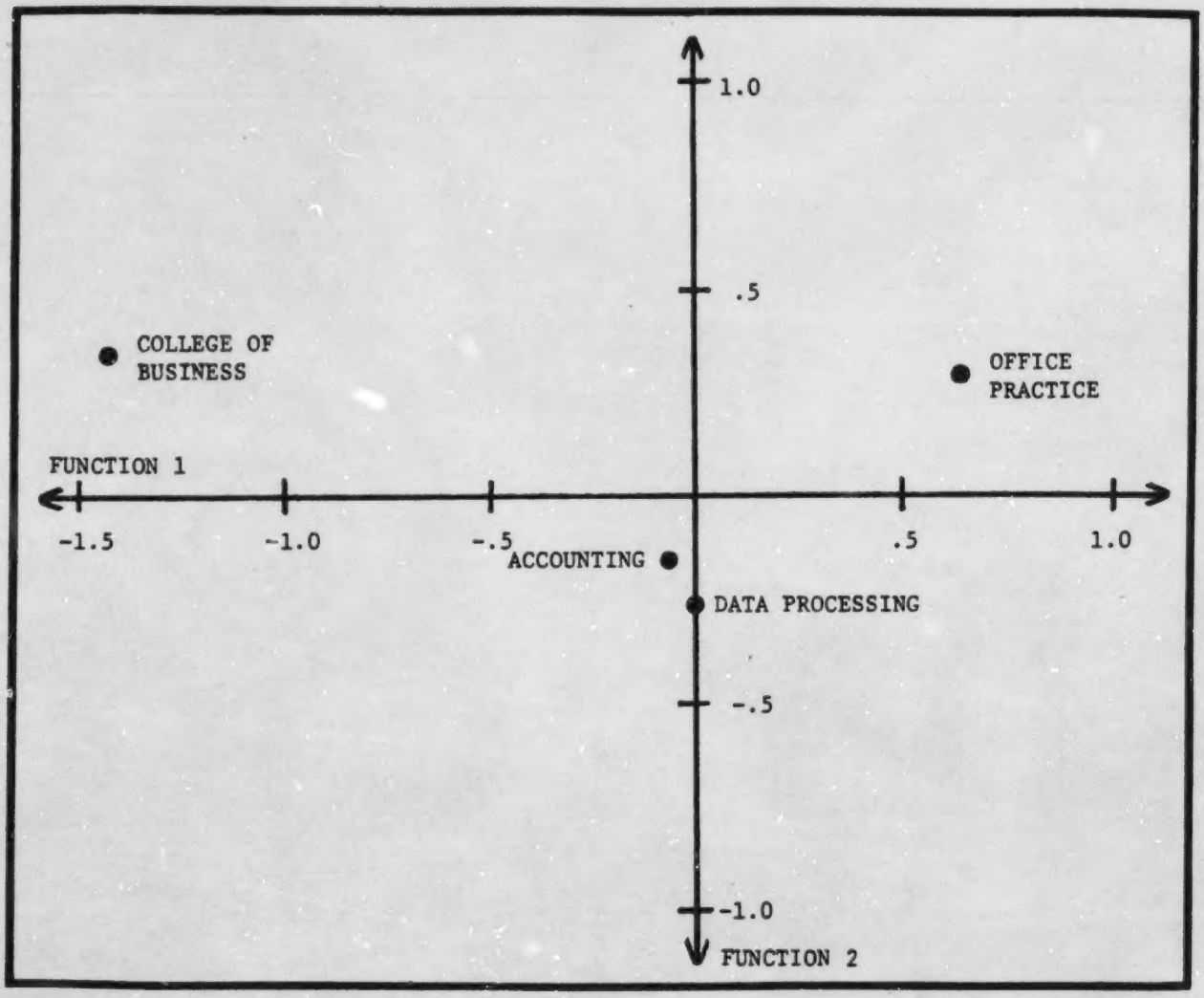

Figure 2. Centroids of the four programs in the Business careers area on the first and second discriminant functions.

The second group was composed of Accounting and Data Processing students with somewhat lower Reading Comprehension (M=9.44) and Math (M=48.36) scores. The third group were Office Practices students who had fairly low Reading Comprehension (M=8.86) and Math (M=43.07) scores.

The second discriminant function was determined primarily by one variable, Space Relations. The second function separated two groups of students with low Space Relations scores (College of Business and Office Practices) from two groups with higher scores (Data Processing and Accounting). Thus, with just four variables and two discriminant functions, we were able to correctly classify 85% of the College of Business students and 70% of the Office Practices students. These two groups exhibited fairly distinct proviles, while the Accounting and Data Processing students had less distinct profiles.

Engineering Programs

In the Engineering career area, two discriminant functions were identified (Table 9). The first discriminant function was very similar to the first discriminant function for the Business area, in that Reading Comprehension and Math were the principle contributors. As in the Business area, Reading Comprehension and Math were the first two variables to enter and Abstract Reasoning was not included due to lack of discriminating power. Figure 3 shows that the first discriminant function divided students in the Engineering programs into three distinct groups. The first group consisted of College of Engineering students with high Reading Comprehension (M=11.15) and high Math (M=61.36) scores. The second group was comprised of Civil Technology, Electro-Mechanical

Table 9

Multiple Discriminant Analysis Results Using Students in Six ENGINEERING Programs and Proposed Cognitive Skill Measures.

Variable[a]	Standardized Coefficients		Step of Entry	Wilks Lambda
	Function 1	Funtion 2		
CAT	-.510	.224	1	.743*
MAT	-.609	.020	2	.654*
SRE	.160	-1.034	3	.605*
WRI	-.181	.129	4	.597*

[a]ABT (Abstract Reasoning) did not add to the discriminating power of the other variables, consequently it was not included in the discriminant functions.

*$p < .001$

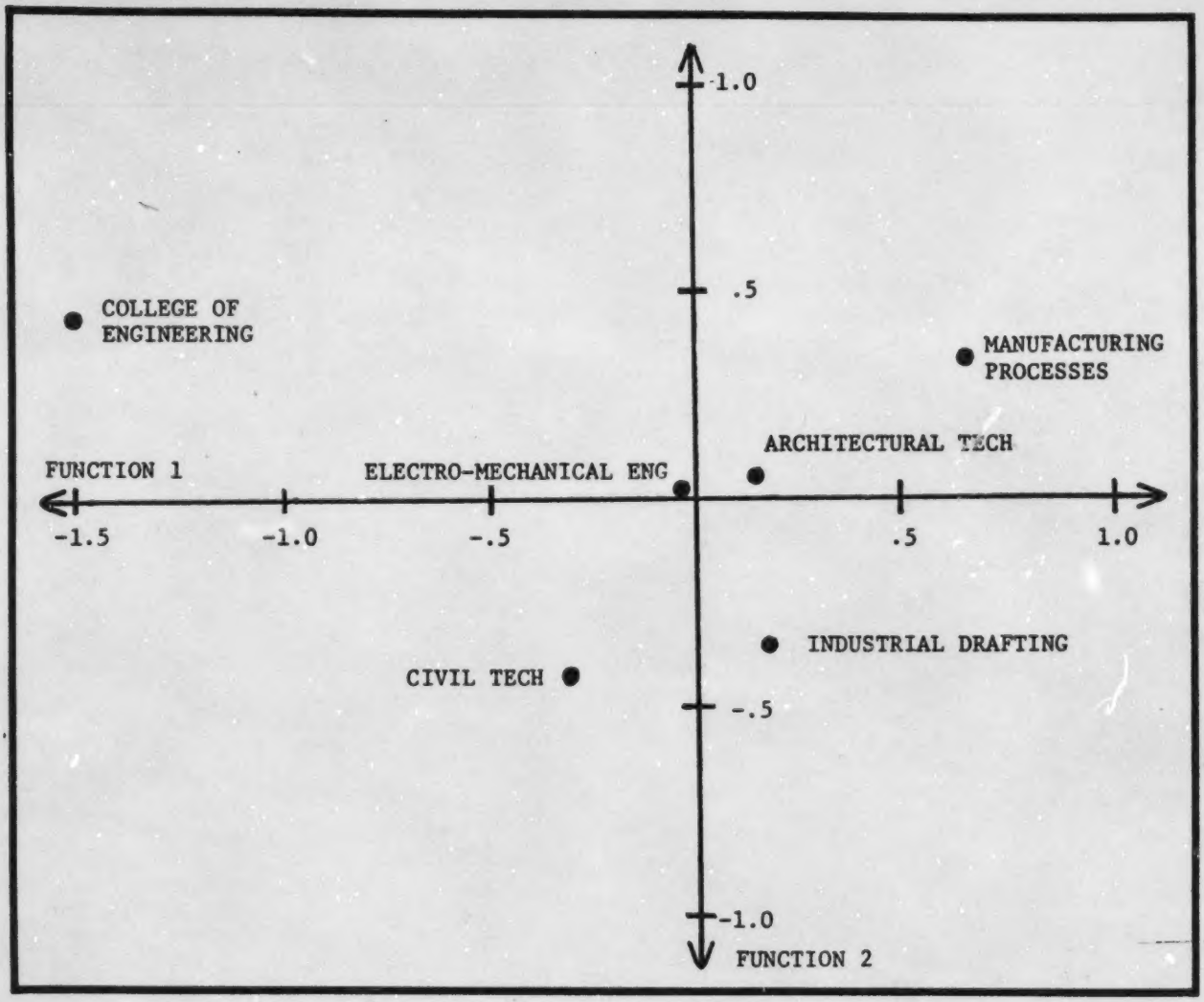

Figure 3. Centroids of the six programs in the Engineering careers area on the first and second discriminant functions.

Technology, Architectural Technology and Industrial Drafting students. Their mean Reading Comprehension (M=9.69) and Math (M=47.36) scores were lower than the other two groups.

The second discriminant function was a composite of all four variables entering the analysis. Although the second function contributed to total group separation, the function was difficult to interpret. By utilization of four variables and two discriminant functions, 79% of the College of Engineering students and 58% of the Manufacturing Processes students were correctly classified. Thus, through the utilization of Reading Comprehension and Math profiles, three distinct groups of Engineering students were identified.

Science Programs

In the Science area, one discriminant function consisting of three variables was used to correctly classify 41% of the students. Math, Space Relations and Reading Comprehension were the three variables defining the discriminant function (see Table 10). Figure 4 shows that these three variables separated the College of Science Students from students in the other three science programs. Most specifically, College of Science students had higher Math (M=56.15), Space Relations (M=44.10) and Reading Comprehension (M=10.89) scores than did students in the other three programs (Math, M=43.64; Space Relations, M=29.08; Reading Comprehension, M=9.14). The two groups whose centroids fell at the extreme ends of the discriminant function for science, were the easiest groups to classify. Seventy-nine percent of the College of Science students and 69% of the Medical Record Technology students

Table 10

Multiple Discriminant Analysis Results Using Students in Four SCIENCE Programs and Proposed Cognitive Skill Measures.

Variable[a]	Standardized Coefficients Function 1	Step of Entry	Wilks Lambda
MAT	-.475	1	.745*
SRE	-.496	2	.646*
CAT	-.324	3	.598*

[a]ABT (Abstract Reasoning) and WRI (NTID Writing) did not add to the discriminating power of the other three variables, consequently they were not included in the discriminant functions.

*$p < .001$

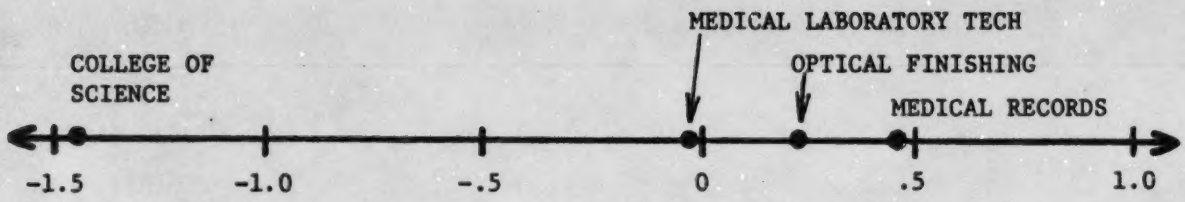

Figure 4. Centroids of the four programs in the Science area on the discriminant function.

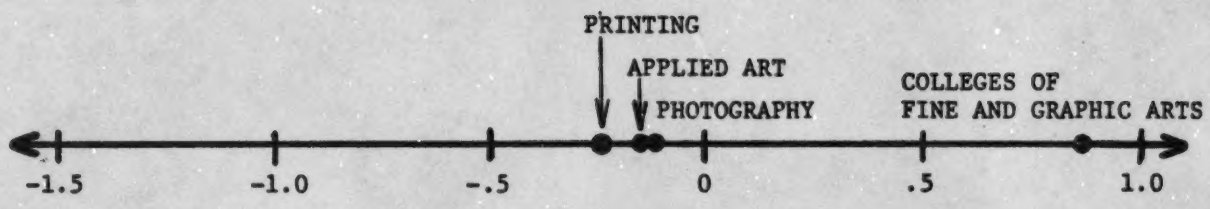

Figure 5. Centroids of the four programs in the Visual Communications area on the discriminant function.

were correctly classified. Although only 20% of the Optical Finishing and Medical Laboratory Technology students were correctly classified, the overall classification ability of one function comprised of only three variables was quite powerful.

Visual Communications Programs

As in the Science area, only one discriminant function was found to be significant for the Visual Communications programs. Reading Comprehension and Space Relations were found to be the only variables contributing to the differentiation among students in these programs (Table 11). Figure 5 shows that the discriminant function derived with these variables served to separate the College of Fine and Graphic Arts students from students in the other three programs. The College of Fine and Graphic Arts students had higher Reading Comprehension (M=10.27) and Space Relations (M=41.96) scores than did students in the Applied Photography, Printing and Applied Arts programs (Reading Comprehension, M=8.92; Space Relations, M=33.22). Using only one function and the two variables, 76% of the College of Fine and Graphic Arts students and 57% of the Printing students were correctly classified.

In summary, MDA was used to examine group differences within four NTID career areas. Within Business and Engineering, students could be separated into three profile levels based primarily on their Math and Reading Comprehension scores. Within the Science and Visual Communication programs, students cross-registered in RIT colleges displayed the most unique score profiles. Space Relations scores were important for separating groups of students in the Visual Communications programs.

Table 11

Multiple Discriminant Analysis Results Using Students in Four VISUAL COMMUNICATIONS Programs and Proposed Cognitive Skill Measures.

Variable[a]	Standardized Coefficients Function 1	Step of Entry	Wilks Lambda
CAT	.738	1	.882*
SRE	.444	2	.846*

[a]ABT (Abstract Reasoning), WRI (Writing), and MAT (Math) did not add to the discriminating power of these variables.

*$p < .001$

Abstract Reasoning was not a potent variable for examining group differences within the NTID career areas.

The actual utility and generalizability of this classification procedures needs to be tested by applying the weights derived from this study to the cognitive skill scores of incoming students. Predicted area and program classification could then be compared with actual choice.

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APPENDIX A: Correlation Matrices and Tables of Means and Standard Deviations for All Variables for Each of Five Career Areas at NTID.

TABLE

A1 Correlations for Business Career Area

A2 Correlations for Engineering Career Area

A3 Correlations for Science Career Area

A4 Correlations for Visual Communications Career Area

A5 Correlations for Social Work Career Area

A6 Means and Standard Deviations for Business Career Area

A7 Means and Standard Deviations for Engineering Career Area

A8 Means and Standard Deviations for Science Career Area

A9 Means and Standard Deviations for Visual Communications Career Area

A10 Means and Standard Deviations for Social Work Career Area

TABLE A1

CORRELATION MATRIX FOR VARIABLES IN THE EXTENDED DATA SET FOR THE BUSINESS CAREER AREA

PEARSON CORRELATION / N		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1.	D ABSTRACT REASONING	-	176	320	104	103	319	321	316	316	307	316	313	309	321	321	321	321	320	265	311	314	316	314	312	201	321	145	145	145	145	145	145
2.	D CLERICAL SPEED	.08	-	194	119	119	191	194	192	192	186	192	189	186	194	194	194	194	194	146	192	193	192	193	192	116	194	03	03	03	03	03	03
3.	D VERBAL REASONING	.34*	.06	-	121	121	335	338	334	334	325	334	330	327	339	339	339	339	338	278	328	331	334	331	329	213	339	145	145	145	145	145	145
4.	D NUMERICAL ABILITY	.37*	.09	.52*	-	120	119	121	121	121	112	121	118	121	121	121	121	121	121	107	121	121	121	121	120	80	121	02	02	02	02	02	02
5.	D SPELLING	.21	.11	.51*	.48*	-	119	121	121	121	112	121	118	121	121	121	121	121	121	107	120	120	121	120	119	80	121	02	02	02	02	02	02
6.	D MECHANICAL RELATIONS	.38*	-.01	.42*	.32*	.21	-	336	331	331	322	331	328	324	336	336	336	336	335	278	325	328	331	328	326	211	336	145	145	145	145	145	145
7.	D SPATIAL RELATIONS	.46*	.16	.31*	.41*	.07	.50*	-	334	334	325	334	330	327	339	339	339	339	338	279	328	331	334	331	329	213	339	145	145	145	145	145	145
8.	C READING	.23*	.03	.58*	.36*	.37*	.34*	.16*	-	337	327	336	332	329	337	337	337	337	336	280	326	329	334	331	329	211	337	143	143	143	143	143	143
9.	C SENTENCE	.28*	.00	.62*	.40*	.60*	.26*	.12	.55*	-	327	336	332	329	337	337	337	337	336	280	326	329	334	331	329	211	337	143	143	143	143	143	143
10.	C MATH	.42*	.21	.63*	.79*	.63*	.42*	.44*	.34*	.36*	-	326	323	319	328	328	328	328	327	270	317	320	324	322	320	203	328	140	140	140	140	140	140
11.	C YEAR 2000	.34*	-.08	.60*	.42*	.45*	.33*	.13*	.52*	.60*	.39*	-	332	329	336	336	336	336	335	279	335	328	333	330	328	211	336	143	143	143	143	143	143
12.	C MOSAIC COMPARISONS	.29*	.56*	.17*	.27	.13	.24	.41*	.11	.13*	.33*	.11	-	326	332	332	332	332	331	276	321	324	329	326	324	209	332	142	142	142	142	142	142
13.	C LETTER GROUPS	.46*	.06	.35*	.38*	.29*	.34*	.43*	.24*	.24*	.49*	.28*	.39*	-	329	329	329	329	328	274	318	321	326	323	321	209	329	142	142	142	142	142	142
14.	CUMULATIVE QUALITY POINTS	.06	.11	.20*	.32*	.22*	.03	.08	.11	.18*	.22*	.20*	.11	.05	-	345	345	345	344	284	334	337	340	337	335	217	343	146	146	146	146	146	146
15.	GRADE POINT AVERAGE	.16	.17	.25*	.14	.17	.09	.20*	.16*	.18*	.28*	.16*	.13	.17*	.25*	-	345	345	344	284	334	337	340	337	335	217	343	146	146	146	146	146	146
16.	STYLE WRITING	.24*	-.11	.39*	.42*	.48*	.21*	.05	.34*	.52*	.25*	.48*	-.00	.13*	.15*	.22*	-	345	344	284	334	337	340	337	335	217	343	146	146	146	146	146	146
17.	CALIFORNIA READING COMPREH.	.39*	.05	.66*	.61*	.54*	.41*	.32*	.54*	.61*	.49*	.63*	.19*	.38*	.29*	.28*	.52*	-	344	284	334	337	340	337	335	217	343	146	146	146	146	146	146
18.	PURE TONE AVERAGE	-.02	.13	.03	.02	.10	.07	.12	-.05	-.07	.07	-.16*	.15*	.06	-.02	-.06	-.11	-.06	-	284	334	337	340	337	335	216	344	145	145	145	145	145	145
19.	HEARING DISCRIMINATION	.07	-.09	.01	-.05	-.08	-.05	-.13	.11	.15*	-.02	.26*	-.07	-.00	.13	.04	.24*	.24*	-.70*	-	279	281	283	280	278	182	284	133	133	133	133	133	133
20.	SPEECH READING / NO SOUND	.12	-.02	.18*	.12	.28*	.03	-.13*	.25*	.34*	-.01	.34*	-.03	.12	.19*	.01	.37*	.33*	-.23*	.31*	-	332	331	329	327	209	334	137	137	137	137	137	137
21.	SPEECH READING WITH SOUND	.10	-.11	.20*	.04	.20	.00	-.12	.22*	.33*	.02	.38*	-.06	.11	.15*	-.01	.35*	.35*	-.51*	.71*	.72*	-	334	332	330	213	337	139	139	139	139	139	139
22.	SPEECH EXPRESSIVE	.10	-.00	.20*	-.03	.08	.05	-.11	.20*	.28*	.01	.35*	-.06	.10	.08	.01	.25*	.27*	-.43*	.61*	.61*	.79*	-	335	333	215	340	143	143	143	143	143	143
23.	MANUAL RECEPTION	.07	-.07	.03	.06	.28*	.08	.08	.01	-.07	.05	-.05	.14*	.10	.19*	-.06	-.07	-.02	.32*	-.39*	-.10	-.25*	-.33*	-	333	212	337	139	139	139	139	139	139
24.	SIMULTANEOUS RECEPTION	.28*	-.13	.26*	.25*	.44*	.20*	.01	.31*	.37*	.09	.46*	.02	.20*	.08	.02	.38*	.47*	-.33*	.49*	.52*	.66*	.52*	.08	-	210	335	138	138	138	138	138	138
25.	AGE OF ONSET	.11	-.04	.28*	.09	-.05	.22*	.03	.14	.22*	.06	.13	.03	.07	.00	-.01	.13	.20*	.10	-.06	.10	.06	.05	.04	.06	-	217	98	98	98	98	98	98
26.	CREDIT HOURS	-.01	.05	.10	.22*	.13	-.00	.01	.05	.11	.09	.13*	.06	-.02	.95*	.03	.10	.18*	-.00	.10	.18*	.14*	.06	.20*	.05	-.01	-	146	146	146	146	146	146
27.	S READING COMPREH.	.12	NA	.07	NA	NA	.11	.11	.07	.02	-.04	-.06	.07	.04	-.11	-.07	.02	.11	.04	-.03	.09	-.02	-.07	.22*	.15	.03	-.11	-	146	146	146	146	146
28.	S LANGUAGE	.06	NA	.04	NA	NA	.06	.10	-.05	-.04	-.01	-.10	.08	.07	-.12	-.05	-.02	.02	.05	-.07	.05	-.05	-.06	.21*	.05	-.01	-.11	.87*	-	146	146	146	146
29.	S MATH COMPREH.	.10	NA	-.11	NA	NA	.05	.14	-.10	-.13	.07	-.19	.11	.08	-.14	-.01	-.10	-.05	.09	-.10	-.13	-.18	-.18	.23*	.01	-.05	-.17	.82*	.84*	-	146	146	146
30.	S MATH CONCEPTS	.12	NA	-.13	NA	NA	.09	.17	-.10	-.14	.06	-.23*	.11	.08	-.12	-.02	-.15	-.08	.10	-.13	-.13	-.22*	-.21*	.28*	-.04	-.08	-.16	.82*	.83*	.91*	-	146	146
31.	S MATH APPLICATIONS	.16	NA	-.02	NA	NA	.14	.21*	-.04	-.06	.09	-.11	.12	.08	-.10	-.01	-.07	.01	.07	-.07	-.05	-.14	-.14	.18	.01	-.06	-.13	.85*	.84*	.90*	.88*	-	146
32.	S BATTERY TOTAL	.10	NA	-.06	NA	NA	.08	.13	-.08	-.10	.03	-.15	.08	.04	-.14	-.01	-.06	-.02	.06	-.07	-.05	-.13	-.13	.22*	.02	-.04	-.17	.89*	.89*	.95*	.95*	.94*	-

Note: Pearson correlations are reported in the lower triangle; N's for each pair of variables are reported in the upper triangle.
NA indicates that too few subjects had complete data to allow interpretation of correlations.
C = subtest of Career Guidance and Placement Program
D = subtest of Differential Aptitude Test
S = subtest of Stanford Achievement Test
*p<.01

TABLE A2

CORRELATION MATRIX FOR VARIABLES IN THE EXTENDED DATA SET FOR THE ENGINEERING CAREER AREA

PEARSON CORRELATION / N		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1.	D	ABSTRACT REASONING	-	126	245	71	71	241	243	236	236	226	236	235	231	245	245	245	245	245	205	232	233	241	235	234	161	245	119	119	119	119	119	119
2.	D	CLERICAL SPEED	.17	-	136	80	80	133	137	133	133	123	133	130	126	137	137	137	137	137	106	134	133	133	135	135	82	137	4	4	4	4	4	4
3.	D	VERBAL REASONING	.22*	-.16	-	81	81	252	254	247	247	237	247	246	242	256	256	256	256	256	215	243	244	252	246	245	168	256	121	121	121	121	121	121
4.	D	NUMERICAL ABILITY	.50*	.36*	.35*	-	82	79	82	82	82	71	82	81	82	82	82	82	82	82	73	80	81	82	81	81	58	82	3	3	3	3	3	3
5.	D	SPELLING	.17	-.09	.62*	.35*	-	79	82	82	82	71	82	81	82	82	82	82	82	82	73	80	81	82	81	81	58	82	3	3	3	3	3	3
6.	D	MECHANICAL RELATIONS	.36*	-.01	.49*	.39*	.27*	-	253	246	246	251	246	245	241	254	254	254	254	254	214	241	242	251	244	243	166	254	120	120	120	120	120	120
7.	D	SPATIAL RELATIONS	.40*	.27*	.25*	.51*	.16	.49*	-	249	249	239	249	248	244	257	257	257	257	257	216	244	245	253	247	246	168	257	120	120	120	120	120	120
8.	C	READING	.16*	-.05	.68*	.35*	.53*	.46*	.18*	-	252	239	252	248	244	252	252	252	252	252	214	243	244	252	244	243	166	252	117	117	117	117	117	117
9.	C	SENTENCE	.14	-.09	.66*	.26*	.52*	.47*	.19*	.64*	-	239	252	248	244	252	252	252	252	252	214	243	244	252	244	243	166	252	117	117	117	117	117	117
10.	C	MATH	.40*	.22*	.36*	.77*	.40*	.27*	.42*	.26*	.24*	-	239	238	234	242	242	242	242	242	203	231	232	241	235	234	159	242	117	117	117	117	117	117
11.	C	YEAR 2000	.30*	.04	.68*	.37*	.46*	.45*	.27*	.61*	.63*	.38*	-	248	244	252	252	252	252	252	214	243	244	252	244	243	166	252	117	117	117	117	117	117
12.	C	MOSAIC COMPARISONS	.29*	.50*	.01	.40*	-.04	.22*	.42*	.12	.01	.38*	.15*	-	243	251	251	251	251	251	214	240	241	250	243	242	165	251	119	119	119	119	119	119
13.	C	LETTER GROUPS	.38*	.24*	.23*	.51*	.21	.28*	.44*	.18*	.22*	.51*	.29*	.34*	-	247	247	247	247	247	210	236	238	246	239	238	164	247	119	119	119	119	119	119
14.		CUMULATIVE QUALITY POINTS	.18*	.26*	.07	.38*	.13	.22*	.20*	.20*	.13	.20*	.19*	.28*	.09	-	262	262	262	262	221	249	250	258	252	251	170	262	121	121	121	121	121	121
15.		GRADE POINT AVERAGE	.20*	.20*	.12	.59*	.12	.20*	.25*	.13	.11	.31*	.19*	.17*	.19*	.37*	-	262	262	262	221	249	250	258	252	251	170	262	121	121	121	121	121	121
16.		STEP WRITING	.15*	-.08	.42*	.33*	.42*	.34*	.17*	.33*	.39*	.17*	.42*	-.09	.09	.16*	.27*	-	262	262	221	249	250	258	252	251	170	262	121	121	121	121	121	121
17.		CALIFORNIA READING COMPREH.	.31*	.05	.70*	.63*	.59*	.49*	.28*	.65*	.63*	.40*	.64*	.11	.27*	.27*	.30*	.53*	-	262	221	249	250	258	252	251	170	262	121	121	121	121	121	121
18.		PURE TONE AVERAGE	-.06	.18	-.16*	-.08	-.06	-.07	-.04	-.10	-.11	-.01	-.09	.22*	.03	.04	.02	-.17*	-.20*	-	221	249	250	258	252	251	170	262	121	121	121	121	121	121
19.		HEARING DISCRIMINATION	.03	-.30*	.33*	.11	.19	-.07	-.08	.22*	.22*	-.02	.21*	-.25*	-.03	.01	-.06	.32*	.28*	-.67*	-	215	215	219	213	212	149	221	112	112	112	112	112	112
20.		SPEECH READING / NO SOUND	.15*	-.08	.44*	.06	.22	.29*	.05	.33*	.44*	.17*	.38*	-.12	.04	.12	.14	.41*	.49*	-.29*	.46*	-	246	246	242	241	161	249	111	111	111	111	111	111
21.		SPEECH READING WITH SOUND	.11	-.24*	.46*	.06	.26*	.27*	.03	.34*	.45*	.11	.36*	-.17*	-.02	.09	.03	.46*	.48*	-.50*	.70*	.76*	-	246	243	242	163	250	113	113	113	113	113	113
22.		SPEECH EXPRESSIVE	.07	-.17	.37*	.06	.14	.19*	-.03	.23*	.35*	.05	.26*	-.18*	-.03	.04	.13	.34*	.39*	-.45*	.61*	.68*	.81*	-	249	248	170	258	121	121	121	121	121	121
23.		MANUAL RECEPTION	.03	-.03	-.13	.00	-.02	.04	.03	-.14	-.16*	-.08	-.08	.06	-.12	.22*	-.06	-.06	-.11	.11	-.27*	-.21*	-.26*	-.35*	-	248	166	252	113	113	113	113	113	113
24.		SIMULTANEOUS RECEPTION	.13	-.20*	.41*	.18	.39*	.33*	.04	.36*	.40*	-.06	.40*	-.09	.01	.08	.07	.43*	.46*	-.34*	.53*	.52*	.61*	.47*	.17*	-	165	251	112	112	112	112	112	112
25.		AGE OF ONSET	.02	-.27*	.20*	.20	.15	.23*	.07	.09	.28*	-.05	.18*	-.08	.11	-.09	.01	.17	.15	.02	.12	.08	.10	.19*	-.05	.05	-	170	86	86	86	86	86	86
26.		CREDIT HOURS	.10	.21*	.01	.23	.05	.14	.11	.16*	.11	.07	.13	.22*	.03	.95*	.18*	.09	.20*	.03	.02	.07	.07	.01	.22*	.05	-.10	-	121	121	121	121	121	121
27.	S	READING COMPREH.	.04	NA	-.03	NA	NA	-.03	.08	-.11	-.20	.01	-.06	.07	-.02	-.13	-.12	.08	-.00	.08	.05	.09	-.01	.01	.14	.02	.02	-.08	-	121	121	121	121	121
28.	S	LANGUAGE	.03	NA	-.09	NA	NA	-.07	.08	-.20	-.22*	.01	-.11	.13	.03	-.13	-.12	.08	-.09	.13	-.06	.03	-.10	-.11	.29*	.01	.05	-.07	.83*	-	121	121	121	121
29.	S	MATH COMPREH.	-.02	NA	-.28*	NA	NA	-.22*	.04	-.36*	-.40*	.08	-.27*	.18	.02	-.11	-.10	-.08	-.26*	.22*	-.14	-.12	-.25*	-.23*	.25*	-.09	.03	-.05	.83*	.82*	-	121	121	121
30.	S	MATH CONCEPTS	.04	NA	-.23*	NA	NA	-.12	.09	-.35*	-.37*	.10	-.25*	.16	.10	-.12	-.08	-.01	-.22*	.16	-.13	-.09	-.24*	-.23*	.28*	-.06	.01	-.09	.82*	.88*	.92*	-	121	121
31.	S	MATH APPLICATIONS	.04	NA	-.21	NA	NA	-.13	.08	-.32*	-.35*	.09	-.25*	.15	.09	-.14	-.09	-.08	-.19	.19	-.10	-.06	-.21	-.18	.24*	-.07	.05	-.09	.83*	.87*	.90*	.93*	-	121
32.	S	BATTERY TOTAL	.03	NA	-.16	NA	NA	-.13	.07	-.26	-.30*	.07	-.18	.13	.05	-.13	-.11	-.01	-.15	.17	-.05	-.02	-.16	-.14	.22	-.04	.03	-.08	.93*	.89*	.95*	.94*	.94*	-

Note: Pearson correlations are reported in the lower triangle; N's for each pair of variables are reported in the upper triangle.
NA indicates that too few subjects had complete data to allow interpretation of correlations.
C = subtest of Career Guidance and Placement Program
D = subtest of Differential Aptitude Test
S = subtest of Stanford Achievement Test
*p<.01

TABLE A3

CORRELATION MATRIX FOR VARIABLES IN THE EXTENDED DATA SET FOR THE SCIENCE CAREER AREA

PEARSON CORRELATION / N		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1.	D	ABSTRACT REASONING	-	90	157	58	59	156	156	155	155	148	155	150	149	157	157	157	157	157	137	150	151	156	156	152	152	88	157	66	66	66	66	66
2.	D	CLERICAL SPEED	.30*	-	100	65	66	100	100	99	99	96	99	97	95	100	100	100	100	100	85	98	96	99	99	99	55	100	4	4	4	4	4	4
3.	D	VERBAL REASONING	.34*	.18	-	68	69	166	166	167	167	160	167	162	161	169	169	169	169	169	148	162	163	168	164	164	97	169	70	70	70	70	70	70
4.	D	NUMERICAL ABILITY	.51*	.21	.45*	-	68	68	68	68	68	64	68	67	68	68	68	68	68	68	64	68	67	68	68	68	45	68	4	4	4	4	4	4
5.	D	SPELLING	.11	.22	.45*	.25	-	69	69	69	69	65	69	68	69	69	69	69	69	60	60	65	69	68	69	69	69	45	69	4	4	4	4	4	4
6.	D	MECHANICAL RELATIONS	.43*	.21	.42*	.39*	.00	-	166	164	164	157	164	159	158	166	166	166	166	166	145	159	160	165	161	161	95	166	67	67	67	67	67	67
7.	D	SPATIAL RELATIONS	.45*	.38*	.42*	.40*	.04	.63*	-	164	164	157	164	159	158	166	166	166	166	166	145	159	160	165	161	161	95	166	67	67	67	67	67	67
8.	C	READING	.31*	.18	.70*	.41*	.40*	.33*	.32*	-	171	163	171	166	164	171	171	171	171	171	151	165	166	171	167	167	98	171	69	69	69	69	69	69
9.	C	SENTENCE	.25*	.25*	.66*	.37*	.56*	.20*	.20*	.65*	-	163	171	166	164	171	171	171	171	171	151	165	166	171	167	167	98	171	69	69	69	69	69	69
10.	C	MATH	.39*	.24*	.42*	.84*	.30*	.39*	.40*	.42*	.35*	-	163	160	158	163	163	163	163	163	143	157	158	163	159	159	95	163	66	66	66	66	66	66
11.	C	YEAR 2000	.39*	.21	.72*	.40*	.40*	.34*	.38*	.65*	.60*	.32*	-	166	164	171	171	171	171	171	151	165	166	171	167	167	98	171	69	69	69	69	69	69
12.	C	MOSAIC COMPARISONS	.35*	.44*	.15	.46*	.10	.29*	.50*	.14	12	.37*	.15	-	161	166	166	166	166	166	147	160	161	166	162	162	93	166	66	66	66	66	66	66
13.	C	LETTER GROUPS	.43*	.44*	.42*	.45*	.38*	.39*	.42*	.31*	.34*	.44*	.38*	.38*	-	164	164	164	164	164	145	158	159	164	160	160	93	164	67	67	67	67	67	67
14.		CUMULATIVE QUALITY POINTS	.28*	.18	.08	.26	.13	.11	.17	.09	.16	.32*	.05	.26*	.19*	-	173	173	173	173	152	166	167	172	168	168	99	173	70	70	70	70	70	70
15.		GRADE POINT AVERAGE	.22*	.33*	.13	.17	.18	-.03	.18*	.15	.28*	.30*	.22*	.21*	.25*	.38*	-	173	173	173	152	166	167	172	168	168	99	173	70	70	70	70	70	70
16.		HTID WRITING	.10	.03	.37*	.23	.25	.13	.07	.41*	.51*	.26*	.36*	-.02	.21*	.27*	.30*	-	173	173	152	166	167	172	168	168	99	173	70	70	70	70	70	70
17.		CALIFORNIA READING COMPREH.	.37*	.28*	.72*	.54*	.55*	.40*	.37*	.62*	.67*	.44*	.65*	.14	.49*	.26*	.33*	.57*	-	173	152	166	167	172	168	168	99	173	70	70	70	70	70	70
18.		PURE TONE AVERAGE	-.04	.23*	.04	.10	.11	.13	.22*	.08	-.04	.09	.04	.22*	.20*	.02	-.01	-.09	-.02	-	152	166	167	172	168	168	99	173	70	70	70	70	70	70
19.		HEARING DISCRIMINATION	.10	-.14	.18	-.04	-.05	.00	-.10	.08	.22*	.06	.12	-.07	-.05	.12	.07	.23*	.16	-.66*	-	147	149	152	149	148	90	152	63	63	63	63	63	63
20.		SPEECH READING / NO SOUND	.13	.07	.35*	.24	.38*	.13	.06	.29*	.41*	.15	.39*	-.02	.09	.10	.03	.35*	.45*	-.20*	.29	-	163	166	162	162	95	166	65	65	65	65	65	65
21.		SPEECH READING WITH SOUND	.14	-.04	.36*	.13	.19	.09	-.02	.27*	.45*	.12	.37*	-.08	.05	.14	.11	.39*	.45*	-.52*	.59*	.72*	-	167	163	163	95	167	68	68	68	68	68	68
22.		SPEECH EXPRESSIVE	.08	-.13	.33*	.01	.19	.11	-.09	.27*	.39*	.09	.35*	-.21*	.02	-.07	.04	.31*	.37*	-.56*	.67*	.56*	.80*	-	168	168	99	172	70	70	70	70	70	70
23.		MANUAL RECEPTION	.01	-.13	-.17	-.09	-.21	.10	-.11	-.14	-.21*	-.08	-.15	.20*	-.10	.24*	-.09	-.22*	-.24*	.13	-.06	-.19*	-.21*	-.33*	-	165	97	168	66	66	66	66	66	66
24.		SIMULTANEOUS RECEPTION	.23*	.15	.28*	.11	.39*	.16	.05	.26*	.38*	.09	.32*	.06	.12	.08	.10	.27*	.38*	-.34*	.51*	.47*	.65*	.48*	.17	-	98	168	66	66	66	66	66	66
25.		AGE OF ONSET	.08	.14	.31*	.26	.20	.33*	.17	.32*	.23*	.22*	.26*	.04	.21	-.14	-.19	.19	.31*	.05	-.02	.17	.08	.19	.04	.13	-	99	43	43	43	43	43	43
26.		CREDIT HOURS	.22*	.03	.04	.17	.13	.11	.11	.06	.09	.22*	-.02	.19*	.13	.96*	.19*	.23*	.18*	-.00	.12	.08	.11	-.07	.27*	.05	-.09	-	70	70	70	70	70	70
27.	S	READING COMPREH.	.17	NA	-.21	NA	NA	-.09	-.04	-.00	-.10	.00	-.02	.17	-.05	-.15	.13	.12	-.12	-.13	.10	-.07	.08	.03	.10	.12	.02	-.20	-	70	70	70	70	70
28.	S	LANGUAGE	.21	NA	-.21	NA	NA	-.11	-.01	.03	-.05	.04	.04	.17	.08	-.18	.12	.10	-.13	-.10	.03	-.13	.02	-.05	.13	.07	.09	-.23	.89*	-	70	70	70	70
29.	S	MATH COMPREH.	.14	NA	-.25	NA	NA	-.04	.01	-.10	-.21	.17	-.03	.26	.02	-.14	.17	-.01	-.14	-.08	.03	-.11	-.00	-.01	.01	-.02	.07	-.20	.83*	.78*	-	70	70	70
30.	S	MATH CONCEPTS	.16	NA	-.31*	NA	NA	-.12	.00	-.13	-.28*	.13	-.11	.15	.01	-.18	.14	-.01	-.22	-.15	.05	-.19	-.03	-.05	.10	.02	.02	-.23	.88*	.84*	.91*	-	70	70
31.	S	MATH APPLICATIONS	.07	NA	-.16	NA	NA	-.02	.07	-.00	-.13	.22	.02	.15	.05	-.14	.12	.12	-.07	-.13	.16	-.10	.08	.04	.04	.10	.14	-.18	.82*	.76*	.87*	.86*	-	70
32.	S	BATTERY TOTAL	.13	NA	-.26	NA	NA	-.11	-.02	-.06	-.16	.03	.00	.16	-.02	-.22	.10	.02	-.16	-.06	.04	-.12	.01	-.06	.14	.07	.06	-.26*	.95*	.93*	.87*	.91*	.85*	-

Note: Pearson correlations are reported in the lower triangle; N's for each pair of variables are reported in the upper triangle.
NA indicates that too few subjects had complete data to allow interpretation of correlations.
C = subtest of Career Guidance and Placement Program
D = subtest of Differential Aptitude Test
S = subtest of Stanford Achievement Test
*p<.01

TABLE A4

CORRELATION MATRIX FOR VARIABLES IN THE EXTENDED DATA SET FOR THE VISUAL COMMUNICATIONS CAREER AREA

PEARSON CORRELATION / N		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1.	D	ABSTRACT REASONING	-	114	207	84	84	206	206	204	205	189	204	202	198	207	207	207	207	207	181	195	197	206	200	201	131	207	91	91	91	91	91	91
2.	D	CLERICAL SPEED	.04	-	121	90	90	120	120	120	121	107	120	119	116	121	121	121	121	121	104	117	118	120	118	118	76	121	1	1	1	1	1	1
3.	D	VERBAL REASONING	.36*	-.20*	-	93	93	215	215	213	214	198	213	210	207	216	216	216	216	216	189	204	206	215	209	210	136	216	91	91	91	91	91	91
4.	D	NUMERICAL ABILITY	.32*	.13	.31*	-	93	92	92	93	93	80	92	90	91	93	93	93	93	93	85	90	90	92	90	90	69	93	1	1	1	1	1	1
5.	D	SPELLING	.23	.06	.54*	.28*	-	92	92	93	93	80	92	90	91	93	93	93	93	93	85	90	90	92	90	90	69	93	1	1	1	1	1	1
6.	D	MECHANICAL RELATIONS	.38*	.05	.46*	.29*	.32*	-	215	213	214	198	213	210	207	216	216	216	216	216	189	204	206	215	209	210	136	216	91	91	91	91	91	91
7.	D	SPATIAL RELATIONS	.40*	.20	.29*	.35*	.03	.58*	-	213	214	198	213	210	207	216	216	216	216	216	189	204	206	215	209	210	135	216	91	91	91	91	91	91
8.	C	READING	.30*	.16	.75*	.26*	.41*	.39*	.11	-	218	202	217	214	212	218	218	218	218	218	191	206	208	217	211	213	136	218	90	90	90	90	90	90
9.	C	SENTENCE	.30*	.13*	.75*	.37*	.42*	.37*	.15*	.75*	-	203	218	215	212	219	219	219	219	219	192	207	209	218	212	214	137	219	90	90	90	90	90	90
10.	C	MATH	.36*	.04	.44*	.70*	.20	.13*	.35*	.37*	.63*	-	202	200	197	203	203	203	203	203	178	192	194	202	198	200	136	203	88	88	88	88	88	88
11.	C	YEAR 2000	.34*	.14	.71*	.27*	.51*	.41*	.22*	.73*	.74*	.41*	-	215	212	218	218	218	218	218	191	206	208	217	211	213	137	218	90	90	90	90	90	90
12.	C	MOSAIC COMPARISONS	.16*	.48*	.00	.20	.13	.13	.40*	.03	.03	.21*	.09	-	210	215	215	215	215	215	188	203	205	214	208	210	135	215	89	89	89	89	89	89
13.	C	LETTER GROUPS	.35*	.23*	.30*	.42*	.26*	.30*	.35*	.30*	.28*	.41*	.34*	.30*	-	212	212	212	212	212	187	200	202	211	205	207	135	212	89	89	89	89	89	89
14.		CUMULATIVE QUALITY POINTS	.19*	.33*	.16*	.33*	.17	.12	.23*	.03	.06	.13	.04	.17*	.15	-	222	222	222	222	195	210	212	221	214	216	139	222	92	92	92	92	92	92
15.		GRADE POINT AVERAGE	.16*	.04	.17*	.24*	.20	.10	.22*	.05	.08	.24*	.09	.18*	.19*	.40*	-	222	222	222	195	210	212	221	214	216	139	222	92	92	92	92	92	92
16.		WYLD WRITING	.32*	-.10	.48*	.20	.53*	.32*	.17*	.47*	.49*	.19*	.54*	.06	.21*	.09	.20*	-	222	222	195	210	212	221	214	216	139	222	92	92	92	92	92	92
17.		CALIFORNIA READING COMPREH.	.44*	.03	.68*	.29*	.56*	.51*	.36*	.61*	.64*	.42*	.70*	.11	.38*	.17*	.20*	.67*	-	222	195	210	212	221	214	216	139	222	92	92	92	92	92	92
18.		PURE TONE AVERAGE	-.13	.14	-.15	.12	.01	-.08	-.06	-.17*	-.16*	.00	-.19*	.09	.00	-.01	-.01	-.23*	-.26*	-	195	210	212	221	214	216	139	222	92	92	92	92	92	92
19.		HEARING DISCRIMINATION	.18*	.01	.32*	.10	.12	.20*	.07	.32*	.30*	.08	.35*	-.05	.15	.07	-.01	.36*	.45*	-.68*	-	186	188	194	187	189	188	195	83	83	83	83	83	83
20.		SPEECH READING / NO SOUND	.22*	.12	.26*	.04	.24*	.17*	.09	.21*	.24*	-.00	.27*	.03	.15	.24*	.11	.38*	.43*	-.32*	.35*	-	209	210	205	207	132	210	84	84	84	84	84	84
21.		SPEECH READING WITH SOUND	.22*	-.02	.41*	.11	.29*	.27*	.07	.38*	.39*	.07	.41*	-.08	.16*	.14	.03	.49*	.54*	-.51*	.69*	.73*	-	212	207	209	132	212	85	85	85	85	85	85
22.		SPEECH EXPRESSIVE	.26*	-.19	.41*	.15	.25*	.27*	.08	.37*	.44*	.10	.43*	-.07	.15*	.10	.09	.48*	.55*	-.49*	.62*	.63*	.79*	-	214	216	138	221	92	92	92	92	92	92
23.		MANUAL RECEPTION	.01	.15	.16*	.19	.17*	-.13	-.11	-.17*	-.21*	-.06	-.21*	.06	-.04	.15*	.08	-.01	-.16*	.19*	-.29*	-.11	-.19*	-.26*	-	214	134	214	87	87	87	87	87	87
24.		SIMULTANEOUS RECEPTION	.27*	.03	.41*	.14	.53*	.27*	.02	.42*	.40*	.09	.46*	-.07	.19*	.05	.09	.56*	.57*	-.43*	.54*	.55*	.74*	.64*	.03	-	136	216	89	89	89	89	89	89
25.		AGE OF ONSET	.10	.04	.16	.15	.37*	.21*	-.02	.23*	.21*	.06	.24*	.02	.02	-.01	.01	.13	.19*	.10	-.06	.03	.09	.03	.02	.08	-	139	59	59	59	59	59	59
26.		CREDIT HOURS	.15	.34*	.13	29*	.15	.11	.18*	.04	.04	.06	.04	.14	.12	.04*	.24*	.06	.14	.06	.04	.16*	.09	.06	.13	-.01	-.01	-	92	92	92	92	92	92
27.	S	READING COMPREH.	.11	NA	-.07	NA	NA	.04	.14	-.10	-.08	-.01	.17	.03	.17	-.14	.02	.16	.21	.07	-.10	-.00	-.05	-.01	.22	.14	-.10	-.15	-	92	92	92	92	92
28.	S	LANGUAGE	.11	NA	-.10	NA	NA	.01	.13	-.18	-.12	.11	.18	.12	.18	-.10	.11	.13	.17	.12	-.18	-.09	-.15	-.13	.20	.03	-.06	-.12	.88*	-	92	92	92	92
29.	S	MATH COMPREH.	.20	NA	-.22	NA	NA	.02	.16	-.27*	-.21*	.16	-.00	.07	.04	-.13	.07	-.04	.03	.16	-.23	-.21	-.26*	-.18	.29*	-.08	-.07	-.11	.77*	.82*	-	92	92	92
30.	S	MATH CONCEPTS	.14	NA	-.21	NA	NA	.05	.25*	-.29*	-.30*	.08	.01	.09	.19	-.13	.02	-.03	.05	.16	-.20	-.17	-.20	-.19	.29*	-.10	-.05	-.10	.83*	.84*	.89*	-	92	92
31.	S	MATH APPLICATIONS	.26*	NA	-.13	NA	NA	.08	.19	-.19	-.21	.17	.10	.06	.05	-.13	.03	.03	.12	.06	-.16	-.14	-.14	-.10	.22	.02	-.04	-.10	.78*	.84*	.92*	.86*	-	92
32.	S	BATTERY TOTAL	.17	NA	-.14	NA	NA	.07	.25*	-.19	-.20	.09	.11	.06	.15	-.12	.05	.05	.14	.10	-.14	-.08	-.12	-.12	.24*	.02	-.07	-.11	.90*	.90*	.89*	.95*	.89*	-

Note: Pearson correlations are reported in the lower triangle; N's for each pair of variables are reported in the upper triangle.
NA indicates that too few subjects had complete data to allow interpretation of correlations.
C = subtest of Career Guidance and Placement Program
D = subtest of Differential Aptitude Test
S = subtest of Stanford Achievement Test
*p<.01

TABLE A5

CORRELATION MATRIX FOR VARIABLES IN THE EXTENDED DATA SET FOR THE SOCIAL WORK CAREER AREA

PEARSON CORRELATION / N		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1.	D	ABSTRACT REASONING	-	23	43	13	13	43	43	44	44	44	44	44	43	44	44	44	44	44	38	43	43	44	43	42	25	44	22	22	22	22	22	22
2.	D	CLERICAL SPEED	.32	-	23	13	13	23	23	23	23	23	23	23	22	23	23	23	23	23	19	23	23	23	23	23	12	23	01	01	01	01	01	01
3.	D	VERBAL REASONING	.24	-.21	-	13	13	42	42	43	43	43	43	43	42	43	43	43	43	43	37	42	42	43	42	41	25	43	21	21	21	21	21	21
4.	D	NUMERICAL ABILITY	.39	.16	.01	-	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	10	13	01	01	01	01	01	01
5.	D	SPELLING	.11	.07	.61*	.07	-	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	10	13	01	01	01	01	01	01
6.	D	MECHANICAL RELATIONS	.22	-.05	.52*	.22	.13	-	44	44	44	44	44	44	43	44	44	44	44	44	38	43	43	44	43	42	25	44	21	21	21	21	21	21
7.	D	SPATIAL RELATIONS	.35*	-.05	.12	.51	-.38	.43*	-	44	44	44	44	43	44	44	44	44	44	44	38	43	43	44	43	42	25	44	21	21	21	21	21	21
8.	C	READING	.16	-.30	.80*	.08	.37	.50*	.12	-	45	45	45	45	44	45	45	45	45	45	39	44	44	45	44	43	25	45	22	22	22	22	22	22
9.	C	SENTENCE	.23	-.25	.70*	-.11	.36	.36*	.07	.63*	-	45	45	45	44	45	45	45	45	45	39	44	44	48	44	43	29	45	22	22	22	22	22	22
10.	C	MATH	.38*	.19	.39*	.87*	-.10	.27	.42*	.26	.14	-	45	45	44	45	45	45	45	45	39	44	44	45	44	43	25	45	22	22	22	22	22	22
11.	C	YEAR 2000	.19	-.18	.59*	.33	.60	.54*	.16	.61*	.49*	.38*	-	45	44	45	45	45	45	45	39	44	44	45	44	43	25	45	22	22	22	22	22	22
12.	C	MOSAIC COMPARISONS	.12	.67*	-.19	.13	.14	-.08	.10	-.27	-.33*	.15	-.28	-	44	45	45	45	45	45	39	44	44	45	44	43	25	45	22	22	22	22	22	22
13.	C	LETTER GROUPS	.46*	.30	-.20	.46	.06	.09	.32	.05	.21	.49*	.27	.22	-	44	44	44	44	44	38	43	43	44	43	42	24	44	22	22	22	22	22	22
14.		CUMULATIVE QUALITY POINTS	.13	-.04	.13	.21	.25	-.16	-.09	.01	-.12	.26	.03	.16	.25	-	45	45	45	45	39	44	44	45	44	43	25	45	22	22	22	22	22	22
15.		GRADE POINT AVERAGE	.02	-.49*	.22	.07	.15	-.12	-.02	.28	.20	.28	.04	-.11	.04	.40*	-	45	45	45	39	44	44	45	44	43	25	45	22	22	22	22	22	22
16.		WTID WRITING	-.21	-.38	-.05	-.32	-.29	-.03	-.13	.02	.22	-.32	-.04	-.30	.03	-.13	.08	-	45	45	39	44	44	45	44	43	25	45	22	22	22	22	22	22
17.		CALIFORNIA READING COMPREH.	.29	-.18	.59*	.09	.30	.50*	.12	.61*	.48*	.27	.49*	-.20	.10	.18	.42*	-.16	-	45	39	44	44	45	44	43	25	45	22	22	22	22	22	22
18.		PURE TONE AVERAGE	-.13	.00	.02	-.10	.09	.20	.01	-.03	-.06	.16	.01	.08	.12	.09	.23	.00	.06	-	39	44	44	45	44	43	25	45	22	22	22	22	22	22
19.		HEARING DISCRIMINATION	-.09	-.23	.12	.45	.31	.03	-.28	.19	.22	-.18	.31	-.26	-.18	.05	-.13	.11	.19	-.69*	-	38	38	39	38	37	23	39	20	20	20	20	20	20
20.		SPEECH READING / NO SOUND	.06	.05	-.08	-.20	.51	-.16	-.25	-.06	-.00	.05	.09	.04	.06	-.03	-.08	-.23	.02	-.19	.23	-	44	44	43	42	24	44	21	21	21	21	21	21
21.		SPEECH READING WITH SOUND	-.17	-.20	.13	.03	.33	-.02	-.21	.05	.22	-.17	.23	.16	-.10	.07	-.12	.14	.06	-.41*	.70*	.55*	-	44	43	42	24	44	21	21	21	21	21	21
22.		SPEECH EXPRESSIVE	-.13	-.21	.44*	-.29	.22	.15	-.09	.33*	.49*	-.06	.44*	-.31	.02	.06	-.10	.22	.13	-.30	.56*	.28	.67*	-	44	43	25	45	22	22	22	22	22	22
23.		MANUAL RECEPTION	.27	.35	-.07	.10	.08	.22	.19	-.19	-.42*	.29	-.07	.27	.28	.06	-.09	-.13	-.06	-.48*	-.59*	-.17	-.39*	-.35*	-	43	24	44	21	21	21	21	21	21
24.		SIMULTANEOUS RECEPTION	.01	-.30	.47*	-.16	.28	.62*	-.01	.42*	.27	.12	.39*	-.22	-.04	-.02	-.01	.03	.51*	-.26	.46*	.26	.51*	.34*	-.02	-	23	43	20	20	20	20	20	20
25.		AGE OF ONSET	.23	-.05	.55*	-.66	-.42	.39	.11	.41	.51*	.25	.48*	-.32	.37	-.08	-.06	.29	.31	.27	-.24	-.24	.26	.42	.16	.06	-	25	14	14	14	14	14	14
26.		CREDIT HOURS	.12	.13	.08	.18	.19	-.09	-.11	-.07	-.07	.16	.04	.18	.21	.93*	.10	-.16	.06	-.02	.11	-.04	.10	.10	.07	.00	-.01	-	22	22	22	22	22	22
27.	S	READING COMPREH.	-.03	NA	-.35	NA	NA	-.13	-.26	-.39	-.25	-.16	-.25	.02	-.22	.06	-.16	.12	-.07	-.16	.30	.31	.17	-.19	-.22	.08	-.20	.02	-	22	22	22	22	22
28.	S	LANGUAGE	.01	NA	-.33	NA	NA	-.13	-.27	-.49*	-.26	-.14	-.33	.05	-.23	.03	-.16	.17	-.17	-.09	.20	.29	.18	-.21	-.09	.05	-.20	.00	.95*	-	22	22	22	22
29.	S	MATH COMPREH.	.09	NA	-.25	NA	NA	-.13	-.20	-.45	-.22	-.04	-.34	.10	-.17	.10	-.03	.13	-.08	-.04	.12	.21	.09	-.30	-.05	.03	-.20	.02	.93*	.98*	-	22	22	22
30.	S	MATH CONCEPTS	.06	NA	-.30	NA	NA	-.09	-.18	-.46	-.28	-.08	-.31	.10	-.20	.06	-.09	.13	-.12	-.06	.14	.22	.08	-.29	-.05	.03	-.21	-.00	.95*	.99*	.99*	-	22	22
31.	S	MATH APPLICATIONS	.07	NA	-.28	NA	NA	-.12	-.17	-.45	-.26	-.07	-.31	.11	-.20	.08	-.09	.12	-.08	-.10	.17	.21	.09	-.26	-.08	.04	-.19	.02	.96*	.98*	.99*	.99*	22	22
32.	S	BATTERY TOTAL	.04	NA	-.30	NA	NA	-.12	-.23	-.44	-.25	-.11	-.32	.06	-.21	.07	-.12	.13	-.09	-.11	.21	.26	.13	-.23	-.12	.06	-.20	.02	.98*	.99*	.98*	.99*	-	-

Note: Pearson correlations are reported in the lower triangle; N's for each pair of variables are reported in the upper triangle.
NA indicates that too few subjects had complete data to allow interpretation of correlations.
C = subtest of Career Guidance and Placement Program
D = subtest of Differential Aptitude Test
S = subtest of Stanford Achievement Test
*p<.01

TABLE A6

Means and Standard Deviations for Variables in the Extended Data Set for the Business Career Area, and the Number of Subjects on which Each M and SD is Calculated

			N	M	SD
1.	D	ABSTRACT REASONING	321	31.5	11.8
2.	D	CLERICAL SPEED	194	58.6	14.2
3.	D	VERBAL REASONING	339	14.4	6.6
4.	D	NUMERICAL ABILITY	121	21.3	6.8
5.	D	SPELLING	121	68.5	11.9
6.	D	MECHANICAL RELATIONS	336	36.2	7.7
7.	D	SPATIAL RELATIONS	339	32.5	12.1
8.	C	READING	337	32.9	6.6
9.	C	SENTENCE	337	35.0	6.8
10.	C	MATH	328	47.5	7.8
11.	C	YEAR 2000	336	31.8	9.5
12.	C	MOSAIC COMPARISONS	332	57.9	11.9
13.	C	LETTER GROUPS	329	50.9	9.4
14.		CUMULATIVE QUALITY POINTS	345	247.4	128.3
15.		GRADE POINT AVERAGE	345	2.8	.5
16.		NTID WRITING	345	8.5	.9
17.		CALIFORNIA READING COMPREH.	345	9.4	1.2
18.		PURE TONE AVERAGE	344	94.3	16.2
19.		HEARING DISCRIMINATION	284	20.0	28.3
20.		SPEECH READING / NO SOUND	334	43.4	16.7
21.		SPEECH READING WITH SOUND	337	54.8	29.1
22.		SPEECH EXPRESSIVE	340	32.1	11.1
23.		MANUAL RECEPTION	337	65.5	27.3
24.		SIMULTANEOUS RECEPTION	335	76.1	16.3
25.		AGE OF ONSET	217	.4	1.6
26.		CREDIT HOURS	345	91.4	43.6
27.	S	READING COMPREH.	146	56.2	32.3
28.	S	LANGUAGE	146	64.4	37.0
29.	S	MATH COMPREH.	146	84.3	45.0
30.	S	MATH CONCEPTS	146	75.9	41.3
31.	S	MATH APPLICATIONS	146	69.4	38.8
32.	S	BATTERY TOTAL	146	70.3	37.2

TABLE A7

Means and Standard Deviations for Variables in the Extended Data Set for the Engineering Career Area, and the Number of Subjects on which Each M and SD is Calculated

			N	M	SD
1.	D	ABSTRACT REASONING	245	34.1	12.5
2.	D	CLERICAL SPEED	137	56.0	10.3
3.	D	VERBAL REASONING	256	15.8	7.4
4.	D	NUMERICAL ABILITY	82	24.1	7.8
5.	D	SPELLING	82	64.7	12.2
6.	D	MECHANICAL RELATIONS	254	44.4	8.1
7.	D	SPATIAL RELATIONS	257	41.8	11.5
8.	C	READING	252	34.0	7.5
9.	C	SENTENCE	252	35.2	7.3
10.	C	MATH	242	49.8	7.2
11.	C	YEAR 2000	252	32.8	9.7
12.	C	MOSAIC COMPARISONS	251	60.4	10.8
13.	C	LETTER GROUPS	247	51.6	8.8
14.		CUMULATIVE QUALITY POINTS	262	265.5	170.5
15.		GRADE POINT AVERAGE	262	2.9	.6
16.		NTID WRITING	262	8.5	.9
17.		CALIFORNIA READING COMPREH.	262	9.6	1.2
18.		PURE TONE AVERAGE	262	95.1	15.0
19.		HEARING DISCRIMINATION	221	21.3	28.1
20.		SPEECH READING / NO SOUND	249	42.1	19.5
21.		SPEECH READING WITH SOUND	250	52.5	31.1
22.		SPEECH EXPRESSIVE	258	31.8	11.6
23.		MANUAL RECEPTION	252	61.4	27.9
24.		SIMULTANEOUS RECEPTION	251	73.4	19.1
25.		AGE OF ONSET	170	.4	1.5
26.		CREDIT HOURS	262	96.4	53.5
27.	S	READING COMPREH.	121	56.7	32.9
28.	S	LANGUAGE	121	61.0	36.0
29.	S	MATH COMPREH.	121	88.3	47.1
30.	S	MATH CONCEPTS	121	80.1	43.7
31.	S	MATH APPLICATIONS	121	77.1	42.8
32.	S	BATTERY TOTAL	121	73.2	38.4

TABLE A8

Means and Standard Deviations for Variables in the Extended Data Set for the Science Career Area, and the Number of Subjects on which Each M and SD is Calculated

			N	M	SD
1.	D	ABSTRACT REASONING	157	30.6	11.6
2.	D	CLERICAL SPEED	100	56.6	12.6
3.	D	VERBAL REASONING	169	15.9	7.8
4.	D	NUMERICAL ABILITY	68	20.6	6.2
5.	D	SPELLING	69	72.2	11.7
6.	D	MECHANICAL RELATIONS	166	36.3	8.0
7.	D	SPATIAL RELATIONS	166	31.1	10.7
8.	C	READING	171	35.5	7.7
9.	C	SENTENCE	171	37.4	7.6
10.	C	MATH	163	46.6	7.6
11.	C	YEAR 2000	171	32.5	9.9
12.	C	MOSAIC COMPARISONS	166	56.4	11.8
13.	C	LETTER GROUPS	164	49.9	8.8
14.		CUMULATIVE QUALITY POINTS	173	307.7	173.0
15.		GRADE POINT AVERAGE	173	2.9	.5
16.		NTID WRITING	173	9.0	.8
17.		CALIFORNIA READING COMPREH.	173	9.7	1.1
18.		PURE TONE AVERAGE	173	92.9	16.4
19.		HEARING DISCRIMINATION	152	26.6	30.3
20.		SPEECH READING / NO SOUND	166	51.0	16.9
21.		SPEECH READING WITH SOUND	167	67.8	27.8
22.		SPEECH EXPRESSIVE	172	35.4	10.5
23.		MANUAL RECEPTION	168	66.2	29.3
24.		SIMULTANEOUS RECEPTION	168	81.2	13.8
25.		AGE OF ONSET	99	.5	1.8
26.		CREDIT HOURS	173	11.6	59.3
27.	S	READING COMPREH.	70	59.1	38.1
28.	S	LANGUAGE	70	64.3	43.5
29.	S	MATH COMPREH.	70	73.8	49.4
30.	S	MATH CONCEPTS	70	68.7	42.9
31.	S	MATH APPLICATIONS	70	60.4	43.0
32.	S	BATTERY TOTAL	70	65.3	41.5

TABLE A9

Means and Standard Deviations for Variables in the Extended Data Set for the Visual Communications Career Area, and the Number of Subjects on which Each M and SD is Calculated

			N	M	SD
1.	D	ABSTRACT REASONING	207	28.6	13.0
2.	D	CLERICAL SPEED	121	52.9	11.6
3.	D	VERBAL REASONING	216	15.1	8.4
4.	D	NUMERICAL ABILITY	93	18.1	6.2
5.	D	SPELLING	93	64.0	12.0
6.	D	MECHANICAL RELATIONS	216	39.6	8.7
7.	D	SPATIAL RELATIONS	216	35.0	11.9
8.	C	READING	218	33.9	8.9
9.	C	SENTENCE	219	35.1	8.4
10.	C	MATH	203	44.5	7.0
11.	C	YEAR 2000	218	31.9	11.1
12.	C	MOSAIC COMPARISONS	215	56.7	10.9
13.	C	LETTER GROUPS	212	47.8	9.1
14.		CUMULATIVE QUALITY POINTS	222	226.3	137.8
15.		GRADE POINT AVERAGE	222	2.6	.6
16.		NTID WRITING	222	8.3	1.1
17.		CALIFORNIA READING COMPREH.	222	9.2	1.4
18.		PURE TONE AVERAGE	222	92.3	15.9
19.		HEARING DISCRIMINATION	195	22.3	30.7
20.		SPEECH READING / NO SOUND	210	42.4	19.3
21.		SPEECH READING WITH SOUND	212	54.9	31.5
22.		SPEECH EXPRESSIVE	221	33.6	11.7
23.		MANUAL RECEPTION	214	63.7	26.2
24.		SIMULTANEOUS RECEPTION	216	75.9	18.6
25.		AGE OF ONSET	139	.6	1.8
26.		CREDIT HOURS	222	91.7	48.1
27.	S	READING COMPREH.	92	51.9	38.7
28.	S	LANGUAGE	92	56.0	41.1
29.	S	MATH COMPREH.	92	67.6	48.3
30.	S	MATH CONCEPTS	92	66.4	44.8
31.	S	MATH APPLICATIONS	92	60.8	44.8
32.	S	BATTERY TOTAL	92	60.7	42.0

TABLE A10

Means and Standard Deviations for Variables in the Extended Data Set for the Social Work Career Area, and the Number of Subjects on which Each M and SD is Calculated

			N	M	SD
1.	D	ABSTRACT REASONING	44	36.2	8.6
2.	D	CLERICAL SPEED	23	60.3	17.5
3.	D	VERBAL REASONING	43	26.7	9.8
4.	D	NUMERICAL ABILITY	13	23.8	6.4
5.	D	SPELLING	12	79.8	10.5
6.	D	MECHANICAL RELATIONS	44	39.3	8.3
7.	D	SPATIAL RELATIONS	44	33.1	11.2
8.	C	READING	45	47.5	9.7
9.	C	SENTENCE	45	47.6	7.7
10.	C	MATH	45	49.6	7.7
11.	C	YEAR 2000	45	46.5	11.1
12.	C	MOSAIC COMPARISONS	45	57.2	10.7
13.	C	LETTER GROUPS	44	55.1	8.6
14.		CUMULATIVE QUALITY POINTS	45	307.8	147.8
15.		GRADE POINT AVERAGE	45	2.8	.6
16.		NTID WRITING	45	9.4	.4
17.		CALIFORNIA READING COMPREH.	45	11.1	.9
18.		PURE TONE AVERAGE	45	94.1	17.9
19.		HEARING DISCRIMINATION	39	37.6	38.5
20.		SPEECH READING / NO SOUND	44	57.5	18.7
21.		SPEECH READING WITH SOUND	44	78.3	25.4
22.		SPEECH EXPRESSIVE	45	40.6	10.8
23.		MANUAL RECEPTION	44	59.7	35.7
24.		SIMULTANEOUS RECEPTION	43	86.4	15.9
25.		AGE OF ONSET	25	2.1	5.2
26.		CREDIT HOURS	45	309.9	44.8
27.	S	READING COMPREH.	22	34.8	52.8
28.	S	LANGUAGE	22	31.7	48.6
29.	S	MATH COMPREH.	22	34.0	53.5
30.	S	MATH CONCEPTS	22	31.9	49.0
31.	S	MATH APPLICATIONS	22	32.0	49.2
32.	S	BATTERY TOTAL	22	33.5	50.9

Appendix B

Pearson correlation matrices of five tests and GPA for students having 30 or more credit hours at NTID. Each matrix represents a different career area, as specified (r's in the lower half; N's in the top half).

Business

	GPA	CAT	WRI	MAT	SRE	ABT
GPA	___	345	345	328	339	321
CAT	.28*	___	345	328	339	321
WRI	.22*	.52*	___	328	339	321
MAT	.28*	.49*	.25*	___	325	307
SRE	.20*	.32*	.05	.44*	___	321
ABT	.16	.39*	.24*	.42*	.46*	___

* $p \leq .01$

Engineering

	GPA	CAT	WRI	MAT	SRE	ABT
GPA	___	262	262	242	257	245
CAT	.30*	___	262	242	257	245
WRI	.27*	.53*	___	242	257	245
MAT	.31*	.40*	.17*	___	239	226
SRE	.25*	.28*	.17*	.42*	___	243
ABT	.20*	.31*	.15*	.40*	.40*	___

* $p \leq .01$

Appendix B (continued)

Science

	GPA	CAT	WRI	MAT	SRE	ABT
GPA	___	173	173	163	166	157
CAT	.33*	___	173	163	166	157
WRI	.30*	.57*	___	163	166	157
MAT	.30*	.44*	.26*	___	157	148
SRE	.18*	.37*	.07	.37*	___	156
ABT	.22*	.37*	.10	.39*	.45*	___

* p ≤ .01

Visual Communications

	GPA	CAT	WRI	MAT	SRE	ABT
GPA	___	222	222	203	216	207
CAT	.20*	___	222	203	216	207
WRI	.20*	.67*	___	203	216	207
MAT	.24*	.42*	.19*	___	198	189
SRE	.22*	.36*	.17*	.35*	___	206
ABT	.16*	.44*	.32*	.36*	.40*	___

* p ≤ .01

Social Services

	GPA	CAT	WRI	MAT	SRE	ABT
GPA	___	45	45	45	44	44
CAT	.42*	___	45	45	44	45
WRI	.07	-.16	___	45	44	45
MAT	.28	.27	-.32	___	44	44
SRE	-.02	.12	-.13	.07	___	43
ABT	.02	.29	-.21	.38*	.35*	___

* p ≤ .01

Appendix C

Regression Analyses Summary Tables for students having 30 or more hours at NTID between 1973 and 1978. Each analysis is for a different career area at NTID. The dependent variable is GPA. The predictor variables are tests given upon a student's entrance to NTID. (Decimals rounded to nearest one thousandth.)

Business Career Area (N=307)

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
MAT	.307	.094	.094	.307	.013	.198
CAT	.346	.120	.025	.285	.056	.126
WRI	.352	.124	.004	.202	.055	.094
SRE	.360	.130	.006	.211	.004	.095
ABT	.361	.130	.001	.167	-.001	-.032
(CONSTANT)					1.133	

Engineering Career Area (N=225)

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
MAT	.315	.009	.009	.315	.014	.182
WRI	.387	.150	.051	.274	.099	.164
SRE	.407	.166	.016	.263	.006	.120
CAT	.418	.175	.009	.313	.052	.114
ABT	.419	.175	.001	.202	.001	.029
(CONSTANT)					.540	

Science Career Area (N=147)

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
CAT	.329	.108	.108	.329	.063	.135
MAT	.363	.132	.024	.284	.010	.146
WRI	.380	.144	.013	.285	.099	.157
ABT	.386	.149	.005	.208	.003	.072
SRE	.387	.149	.000	.173	.001	.023
(CONSTANT)					.829	

Visual Communications Career Area (N=188)

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
SRE	.262	.068	.068	.262	.010	.202
WRI	.317	.101	.032	.215	.100	.192
MAT	.339	.115	.014	.233	.012	.145
CAT	.341	.116	.001	.211	-.024	-.056
(CONSTANT)					1.132	

Social Work Career Area (N=43)

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
CAT	.399	.159	.159	.399	.259	.417
WRI	.431	.186	.027	.101	.184	.205
MAT	.462	.214	.028	.203	.020	.274
ABT	.488	.238	.025	-.012	-.009	-.139
SRE	.503	.253	.014	-.061	-.007	-.134
(CONSTANT)					-2.241	

Appendix D

Regression Analyses Summary Tables for students having 30 credit hours or more at NTID between 1973 and 1978. Each analysis is for a different major within 5 career areas as indicated. The dependent variable for all equations is GPA. The predictor variables are tests given upon a student's entrance into NTID.

BUSINESS CAREER AREA

* Majors in the College of Business resulting in a Bachelor's degree (N=34)

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
CAT	.354	.125	.125	.354	.191	.312
MAT	.410	.168	.043	.292	.011	.144
ABT	.420	.176	.009	.241	.007	.148
WRI	.427	.182	.006	.068	-.076	-.091
(CONSTANT)					.543	

* Accounting - a major which results in a diploma or AAS degree (N=67)

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
WRI	.308	.095	.095	.308	.171	.283
MAT	.399	.159	.065	.243	.020	.310
CAT	.422	.178	.019	.282	.092	.191
ABT	.444	.197	.019	.053	-.005	.132
SRE	.454	.206	.009	.029	-.004	.110
(CONSTANT)					-.089	

* Data Processing - a major which results in a certificate, diploma or AAS degree (N=104).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
MAT	.405	.164	.164	.105	.022	.311
WRI	.454	.206	.042	.252	.098	.163
SRE	.466	.217	.011	.260	.004	.105
CAT	.473	.224	.007	.309	-.047	.106
ABT	.474	.224	.000	.198	-.007	-.014
(CONSTANT)					.369	

* Office Practice - a major which results in a certificate, diploma or AAS degree (N=83).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
MAT	.399	.159	.159	.399	.029	.299
CAT	.465	.216	.056	.356	.142	.230
SRE	.475	.225	.009	.252	.006	.127
ABT	.477	.227	.002	.179	-.002	-.054
WRI	.477	.227	.000	.204	.012	-.018
(CONSTANT)					.053	

ENGINEERING CAREER AREA

* Majors in the College of Engineering which result in a Bachelor's Degree (N=14).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
MAT	.500	.250	.250	-.500	-.065	-.816
SRE	.593	.352	.102	.180	.026	.435
WRI	.669	.447	.095	-.244	-.199	-.391
CAT	.697	.486	.039	-.325	.141	.296
ABT	.698	.487	.000	.046	.005	.030
(CONSTANT)					5.970	

* Architectural Technology - a major which results in an AAS degree (N=20).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
WRI	.821	.673	.673	.821	.411	.698
MAT	.858	.739	.063	.370	.014	.144
SRE	.871	.758	.021	.479	.011	.168
CAT	.874	.763	.005	.669	.072	.107
ABT	.874	.765	.001	.322	-.002	-.041
(CONSTANT)					-2.555	

* Civil Technology - a major which results in an AAS degree (N=25).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
MAT	.446	.199	.199	.446	.031	.465
CAT	.548	.801	.102	.410	.089	.253
SRE	.554	.307	.007	.163	-.009	-.163
WRI	.565	.319	.012	.198	.067	.132
ABT	.566	.320	.000	.322	.001	.028
(CONSTANT)					.264	

* Industrial Drafting - a major which results in a diploma or AAS degree (N=24).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
SRE	.528	.279	.279	.528	.026	.539
ABT	.548	.301	.021	.083	-.009	-.242
CAT	.587	.344	.044	.272	.101	.226
WRI	.596	.355	.011	-.036	-.065	-.100
MAT	.599	.359	.004	.350	.006	.085
(CONSTANT)					1.366	

* Electro-Mechanical Technology - a major which results in an AAS degree (N=49).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
MAT	.474	.224	.224	.474	.032	.381
WRI	.589	.347	.122	.406	.195	.322
CAT	.597	.356	.009	.371	.043	.096
SRE	.601	.362	.005	.299	.006	.114
ABT	.606	.367	.005	.170	-.004	-.084
(CONSTANT)					-.930	

* Manufacturing Processes - a major which results in a diploma degree (N=36).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
CAT	.262	.069	.069	.262	.182	.217
SRE	.285	.081	.012	.087	.006	.120
MAT	.295	.087	.006	.195	.010	.094
ABT	.301	.090	.003	.011	.003	-.057
WRI	.302	.091	.001	.168	.024	.033
(CONSTANT)					.539	

SCIENCE CAREER AREA

* Majors in the College of Science which result in a Bachelor's degree (N=19).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
SRE	.309	.096	.096	-.309	-.020	-.308
ABT	.335	.112	.016	-.176	-.008	-.102
WRI	.342	.117	.005	-.020	.082	.111
CAT	.347	.121	.003	-.026	-.025	-.047
MAT	.348	.122	.001	-.182	-.003	-.052
(CONSTANT)					3.755	

* Optical Finishing - a major which results in a certificate, diploma or AAS degree (N=47).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
MAT	.328	.108	.108	.328	.019	.306
CAT	.356	.127	.019	.171	.049	.109
ABT	.366	.134	.007	.146	.004	.092
SRE	.371	.138	.004	.042	.003	.065
WRI	.372	.138	.001	.111	.013	.028
(CONSTANT)					1.286	

* Medical Laboratory Technology - a major which results in an AAS degree (N=32).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
CAT	.495	.245	.245	.495	.184	.349
MAT	.552	.305	.060	.348	.019	.234
ABT	.584	.342	.036	.072	-.014	-.260
WRI	.597	.356	.014	.411	.189	.248
SRE	.611	.373	.017	.190	.011	.187
(CONSTANT)					-1.465	

* Medical Record Technology - a major which results in a diploma or AAS degree (N=35).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
CAT	.615	.378	.378	.615	.122	.264
MAT	.704	.496	.118	.580	.029	.327
ABT	.752	.565	.069	.550	.010	.243
WRI	.762	.581	.015	.365	.105	.134
SRE	.766	.586	.006	.491	.006	.105
(CONSTANT)					-.660	

VISUAL COMMUNICATION CAREER AREA

* Majors in the College of Fine Arts or Graphic Arts which result in a Bachelors Degree (N=29).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
MAT	.412	.170	.170	.412	.017	.382
ABT	.463	.214	.044	.387	.009	.269
SRE	.489	.240	.026	.089	-.005	-.138
WRI	.501	.251	.011	.254	.058	.141
CAT	.506	.256	.005	.315	-.032	-.133
(CONSTANT)					1.711	

* Applied Photography - a major which results in a certificate, diploma or AAS degree (N=67).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
SRE	.450	.203	.203	.450	.022	.422
MAT	.464	.216	.013	.235	.013	.135
ABT	.473	.224	.008	.025	-.005	-.113
WRI	.477	.228	.004	.130	.038	.067
(CONSTANT)					1.089	

* Printing - a major which results in a diploma degree (N=53).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
WRI	.345	.119	.119	.345	.191	.350
MAT	.410	.168	.049	.256	.021	.228
ABT	.410	.168	.001	.092	-.002	-.042
SRE	.411	.169	.001	.097	.002	.038
CAT	.412	.170	.000	.276	-.016	-.032
(CONSTANT)					.238	

* Applied Art - a major which results in a certificate, diploma or AAS degree (N=37).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
ABT	.355	.126	.126	.355	.026	.588
CAT	.448	.200	.074	-.009	-.126	-.280
MAT	.459	.211	.010	.006	-.011	-.130
(CONSTANT)					3.427	

SOCIAL WORK CAREER AREA

* Majors in the College of General Education (Social Work Department) which result in a bachelors degree (N=43).

Variables	Multiple R	R Square	R-Square Change	Simple R	B	BETA
CAT	.399	.159	.159	.399	.258	.417
WRI	.431	.186	.027	.101	.184	.205
MAT	.462	.214	.028	.203	.020	.274
ABT	.488	.238	.025	-.012	-.009	-.139
SRE	.503	.253	.014	-.061	-.007	-.134
(CONSTANT)					-2.241	

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